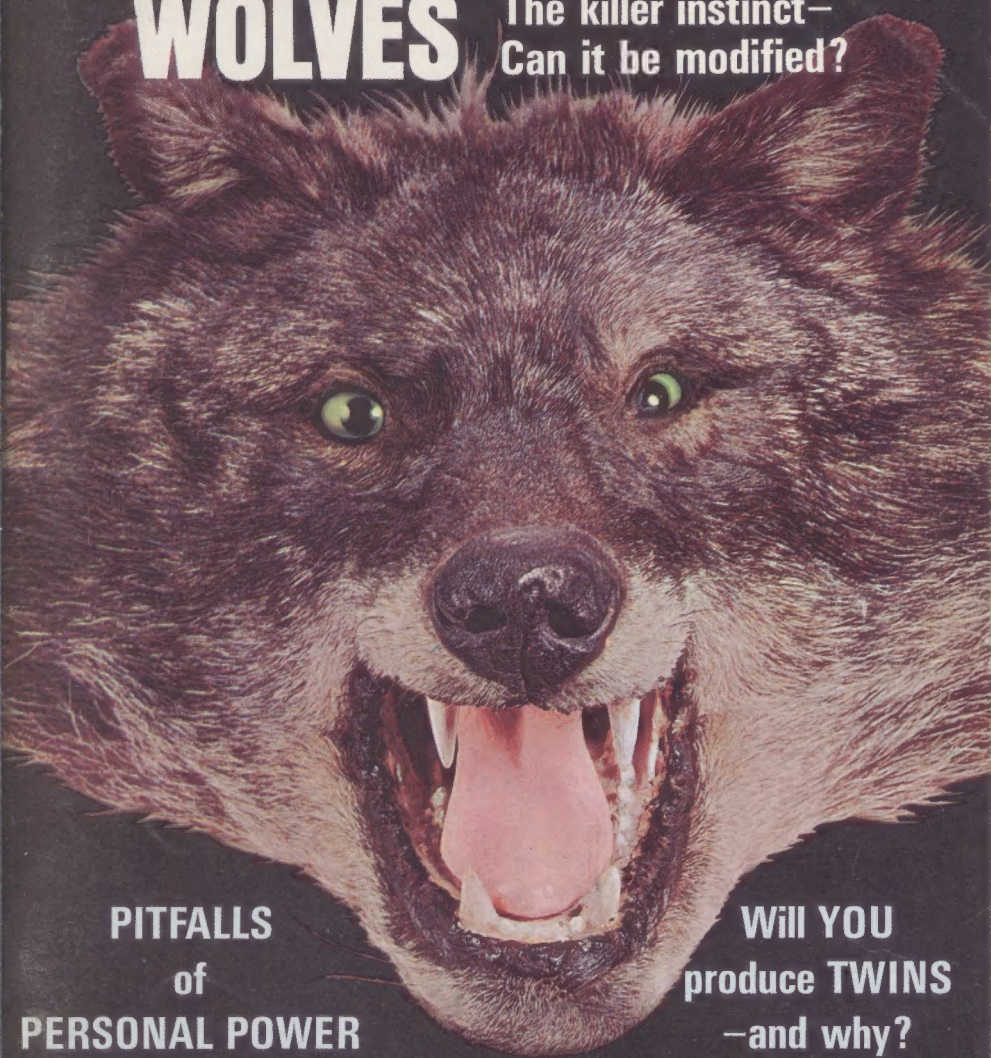


SCIENCE DIGEST

FEBRUARY 1968 • 50 CENTS ICD

WOLVES

The killer instinct—
Can it be modified?



PITFALLS
of

PERSONAL POWER

Will YOU
produce TWINS
—and why?

Science probes the **SECRETS OF KING SOLOMON'S MINES**

ISAAC ASIMOV EXPLAINS the death of the sun

What causes those giant killer waves



Pictorial Parade

The killer octopus

SOME call it "devilfish," and well they might, for this particular octopus, as it's more correctly known, is believed to be one of the world's deadliest creatures. This species, the poisonous ringed octopus, is brightly colored and about the size of a man's hand. (Most of the 140 varieties of octopus are this size; only a few reach the 20-foot proportions generally seen in the movies wrapping their eight arms

around some poor helpless victim.) And while the ferocity of the octopus is generally highly exaggerated—probably because of its unsightly appearance—it is quite deserving of the reputation in this species. One such ringed octopus bit a young soldier in Sydney, New South Wales. The soldier died within an hour of attack, thus giving support to the "deadliest" stigma which has now been placed on this small octopus.

MAIL
ORDER

SHOPPING MART

SCIENCE
FAIR
HQTS.

A selection of products available by mail for readers of Science Digest.
All merchandise sold on a money-back guarantee. Order Direct by Stock No. Send check or M.O.



AMERICAN MADE OPAQUE PROJECTOR

Projects illustrations up to 3"x3 1/4" — enlarges them to 35"x30" if screen is 6 1/2 ft. from projector, larger pictures if screen is further away. No film or negative needed. Projects charts, diagrams, color or black-and-white. Operates on 115 volts A.C. current . . . 6 ft. extension cord and plug included. Size 12"x8"x4 1/2" wide. Weight 1 lb. 2 ozs. Plastic case.

Stock No. 70,199AD ..\$7.95 Ppd.



GIANT WEATHER BALLOONS

"Balls of fun" for kids, traffic stoppers for stores, terrific for amateur meteorologists. Create a neighborhood sensation. Great backyard fun. Exciting beach attraction. Amateur meteorologists use to measure cloud heights, wind speed, and temp. Made of heavy duty neoprene. Inflate with vacuum cleaner or auto air hose; or locally available helium for high rise.

Stock No. 70,568AD 8'..\$2.00 Ppd.

Stock No. 70,632AD 16'..\$7.00 Ppd.



NOW! WATER THAT CLIMBS UP HILL

Amaze your friends - loads of fun - perfect for Science Fair. Water actually flows up side of glass & siphons freely into other container. To stop flow - cut with scissors - watch it snap back. Secret's in special additive with long molecular structure - req. only 1/2 tsp. to glass. Friction reducing additive has all kinds of industrial, agricultural, experimental uses - a pinch even makes gold fish slide thru water faster. 3 oz. can be enough for 84 sips of water. Stock No. 41,086AD ..\$2.00 Ppd.



MODEL DIGITAL COMPUTER

Solve problems, teach logic, play games with miniature version of giant electronic brains! Adds, subtracts, multiplies, shifts, complements, carries, memorizes. Colored plastic parts easily assembled. 12"x3 1/4"x4 1/4". Incl. step-by-step assembly diagrams, 32-p. instruction book covering operation, computer language (binary system) programming, problems & 15 experiments.

Stock No. 70,683AD ..\$5.98 Ppd.



PLASTIC MODEL V-8 ENGINE

Hours of fun! Get thrill of building your own easily assembled engine from over 350 parts. Then push starter and watch it run. Crankshaft revolves, pistons move, valves open and close in sequence with spark plugs. Does everything but burn oil. 1/4 scale, molded in 4 colors. Same motor used in many auto-mechanic courses. Excellent, easy-to-understand "Tech manual".

Stock No. 70,448AD ..\$12.95 Ppd.



WOODEN SOLID PUZZLES

Here's a fascinating assortment of 12 different puzzles to provide hours of pleasure and stimulate ability to think and reason. Animals and geometric forms. Take them apart and reassemble them. Lots of fun for the whole family— young and old. Will test skill, patience and ability to solve problems. Order yours now.

Stock No. 70,205AD ...\$3.50 Ppd.



IT'S HERE - BIG, NEW DIGICOMP II!

If you think DIGICOMP I was something — wait 'til you use DIGICOMP II! Loads of fun! Terrific challenge! Actually works like electronic digital computer but needs no power. Adds, subtracts, multiplies, divides, memorizes, 1st mechanical computer w/auto. switch action. 1st model designed for programming. Speed reduced by factor of million to 1 — you can see what's happening. Demonstrates 'new' math, computer techniques.

Special introductory price:
Stock No. 70,946AD ...\$16.00 Ppd.



CRYSTAL GROWING KIT

Do a crystallography project—illustrate with large beautiful crystals you grow yourself. Study & demonstrate factors affecting growth, refraction, piezoelectric effect, symmetry, etc. Incl. book "Crystals & Crystal Growing" plus generous supply of chemicals to grow 7 large display crystals (clear, purple, blue-green, green and red).

Stock No. 70,336AD ...\$9.50 Ppd.

GET FREE CATALOG



SEND FOR FREE CATALOG "AD"

Completely new 1968 Catalog. 148 pages packed with nearly 4,000 unusual bargains. Exciting new categories. Many new items. 100's of charts, illustrations. Many hard-to-get war surplus bargains. Enormous selection of

telescopes, microscopes, binoculars, magnets, magnifiers, prisms, photo components, etc. For hobbyists, experimenters, workshop. Shop by mail. No salesman will call. Write for Catalog "AD" to Edmund Scientific Co., 300 Edscorp Bldg., Barrington, N.J. 08007.

Name _____
Address _____
City _____
State _____ Zip _____

ORDER BY STOCK NUMBER • SEND CHECK OR MONEY ORDER • MONEY-BACK GUARANTEE

EDMUND SCIENTIFIC CO. 300 EDS CORP BUILDING
BARRINGTON, NEW JERSEY 08007

FEW more terrifying tales have been invented about any wild animal than those foisted on the public about wolves. The world over, he's an outlaw.

It's well established that hungry wolves hunt to kill, for food, "anything from mouse to moose," as one expert puts it. But the fact is that there are no thoroughly documented cases of unprovoked attacks on people by healthy wolves in the North American wild. And there's little doubt the wolf has taken the blame

THIS MONTH

for many attacks by *feral* dogs (domestic dogs gone wild). Six years ago, an eight-year-old boy was killed by such a pack near Cleveland, Ohio.

Those who know wolves vouch for their great intelligence and cunning. They have a much larger brain than dogs. When taken young, they make well-behaved, affectionate pets. People who own them report they have a vocal "language" of gentle whimper to howl, plus facial expressions that can be understood readily by people who take the trouble to observe them.

Few people in this country know them better than Jack and Margie Lynch, who own a pack of 31 magnificent wolves. When I talked to Mr. Lynch on the phone, he not only verified all this, but had a lot more to add. You'll find it incorporated in George Sand's fascinating article on page 7. —R.F.D.

news, knowledge, advice

SCIENCE

RICHARD F. DEMPEWOLFF, Editor
DANIEL COHEN, Managing Editor
BARBARA O'CONNELL, Assistant Editor
JERRY GREER, Assistant Editor
GEORGE V. KELVIN, Art Director
JOHN M. MITCHELL, School Department

Contributing Editors

ISAAC ASIMOV, Ph.D., Biochemistry
JOSEPH D. WASSERSUG, M.D., Medicine
JEANNE REINERT, General Science
MELVIN HERMAN, Psychiatry
STACY V. JONES, Inventions
FLORA SCHREIBER, Psychiatry
ARTHUR SNIDER, Medicine
M. and J. DAUGHERTY, Quiz

Editorial and general offices:

575 Lexington Ave., New York, N.Y. 10022

Subscription offices:

250 West 55th Street, New York, N.Y. 10019

Advertising offices:

WARREN L. VANDEVEER, Advertising Director
575 Lexington Ave., New York, N.Y. 10022
Phone 212 MU 8-8500

Chicago: 520 N. Michigan Ave. 527-2400, J. Nielan, Manager. Detroit: General Motors Bldg., Trinity 5-8711, R. Nelson, Manager. Cleveland: Hanna Bldg., 1422 Euclid Ave., Prospect 1-0456, L. Kessie, Manager. Los Angeles: 3460 Wilshire Blvd., DUnkirk 2-8458, M. Foss, Manager. San Francisco: 1101 Hearst Bldg., YUkon 2-0823.

© 1968 The Hearst Corporation

SCIENCE DIGEST is published monthly by The Hearst Corporation, 959 Eighth Avenue, New York, N.Y., 10019. **RICHARD E. BERLIN**, President; **GEORGE HEARST**, V-Pres.; **RICHARD E. DEEMS**, President of Magazines; **JOHN R. MILLER**, Executive V-Pres., Magazines; **WILLIAM S. CAMPBELL**, V-Pres., Magazines; **ALBERT A. RACHOI**, V-Pres. and Director of Circulation; **RAYMOND J. PETERSEN**, Senior V-Pres. of Magazines; **FRANK MASSI**, Treas.; **HARVEY L. LIPTON**, Sec.

Science Digest—February, 1968

DIGEST®

Outlawed everywhere, canis lupus, the gray wolf, is reputed to be a mean, crafty, ruthless man-killer—except by those who know him well. Jack and Margie Lynch, who live with 31 "lobos", tell a new story about these fellows, on page 7.

Original transparency used on August, 1967, cover of Finance Magazine. Reprinted with permission.



FEBRUARY • 1968

Vol. 63, No. 2

CONTENTS

SCIENCE NEWS

Bulletins at Press Time	5
Science Month	35
New for People	40
New for Industry	64

METEOROLOGY

What's the Weather-Like Inside	82
--------------------------------	----

ARCHAEOLOGY

A SCIENCE MYSTERY: Secret of Zimbabwe—Search for King Solomon's Mines	13
The "Diseased" Statues of Ancient Mexico	24

INVENTIONS

"Undersea Auto"	85
-----------------	----

MEDICINE

Synthetics to Build a Man	57
---------------------------	----

Poisons in the Home	75
How Kids See Their Doctors	80

OCEANOGRAPHY

What Causes Those Giant Waves	30
-------------------------------	----

PHYSIOLOGY

Twins—What Are the Chances?	66
-----------------------------	----

PSYCHIATRY

Pitfalls of Power	48
-------------------	----

TECHNOLOGY

Food Irradiation "Zaps"	
Longer Life	20

ZOOLOGY

They Tamed a Wolf Pack—Or Did They?	7
Jet-Set Animals	42
Lookalikes	46

DEPARTMENTS

This Month	2	Isaac Asimov Explains	89
Colleges in Action	72	Books	92
Quiz	86	Letters	99

SUBSCRIPTION PRICES U.S.A. and Possessions, \$5.00 for one year; \$9.00 for two years; \$13.00 for three years. Canada, add 50¢ for each year. All other countries, add \$1.00 for each year. Special Teachers' and Students' rates available through SCIENCE DIGEST School Plan. 25¢ a copy, minimum order 10 copies per month. Write to: SCIENCE DIGEST School Dept., at address below. Subscription Service: Mail all subscription orders, changes of address, correspondence concerning subscriptions, and Postmaster notices of undeliverable copies to SCIENCE DIGEST, Box No. 654, New York, N. Y. 10019. Please enclose your latest address label for quickest service when writing about your subscription.—Second-class postage paid at New York, N. Y., and at additional mailing offices. Registered as second-class mail at the post office, Mexico, D. F., Mexico, June 20, 1950. Authorized as second-class mail by Post Office Department, Ottawa, and for payment of postage in cash. SCIENCE DIGEST is indexed in READER'S GUIDE TO PERIODICAL LITERATURE. Printed in the U.S.A. Contributions must be accompanied by a self-addressed and stamped envelope.

Science Digest 250 West 55th Street New York, N.Y. 10019

Please enter my subscription to Science Digest for

☐ 1 Year at \$5.00 ☐ 2 Years at \$9.00

☐ Bill me (or) ☐ Payment is enclosed

Name _____
please print

Address _____

City _____ State _____ Zip Code _____

In Canada, add 50c for each year.

All other countries, add \$1.00 per year

clip out coupon here

WSD8B1

18-SECOND COUPON

Try it. Eighteen seconds is all it should take you to fill in this coupon if your name and address are as long as ours.

If there are only two syllables in your name and your address is about the same length as ours, 13 seconds should do it. With six syllables, you ought to make it in 23 seconds.

It's that easy to subscribe to SCIENCE DIGEST—the magazine that brings you each month's significant science news in a bite-size, tasty format.

Maybe, if you already subscribe, you'll want to give a friend or relative a truly useful, fascinating gift. Either way, consider this:

More and more people are discovering how SCIENCE DIGEST keeps them up-to-date on science conveniently, colorfully. So put those 18 seconds (or 13 or 23) to good use. Get a 6-cent stamp and mail the coupon today. It could be the best thing you ever did. Try it.



Bulletins at press time

IS IT LIFE. When scientists at Stanford University artificially produced, in the laboratory the active, infectious inner core of a virus (above) the accomplishment was immediately hailed as the "creation of life in a test tube." But Dr. Arthur Kornberg the Nobel prize winning scientist who headed the Stanford team said he does not believe there is any definition of life that would satisfy both scientists and laymen. The importance of the Stanford experiment is that it gives a better understanding of what life is and how it operates. (A Science Digest special "Man the Creator" will appear in the next issue.)

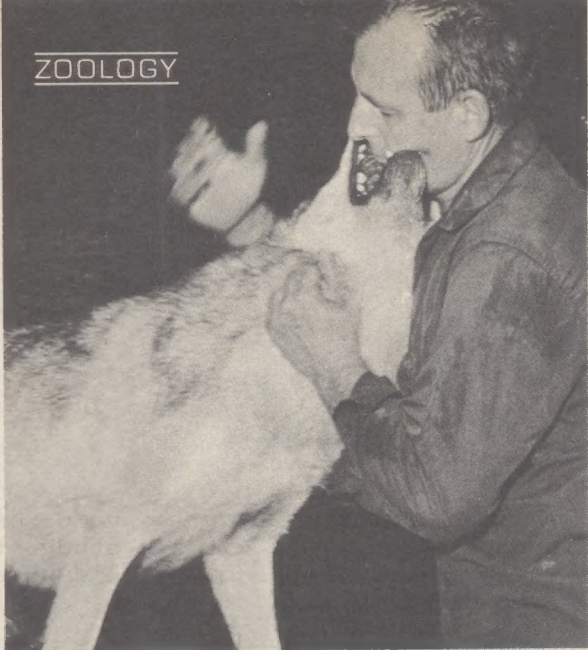
SOVIET UFO STUDY. Prof. Feliks Zigel, a Soviet astronomer has called for a "joint effort of all the scientists of the world" to determine the nature of unidentified flying objects. There is some evidence that Soviet scientists are displaying an increasing interest in UFO's but announcements that the Soviets had formed a special commission to study sighting reports seem to have been premature, and the commission was not formed.

COLDS--ALL IN THE HEAD. Psychoanalyst Dr. Merl M. Jackel said, "the common cold is the result of physiological changes which accompany depressions in certain individuals." He cites a study of 10 patients which found that 25 of 26 colds over a three year period were preceded by depression.

HEART TRANSPLANT FUTURE. The death of Louis Washkansky 18 days after a successful heart transplant operation shows that doctors are still a long way from understanding and controlling the body's immunological defense system which attacks and destroys foreign tissue. Dr. Adrian Kantrowitz, famed heart surgeon believes that heart transplant operations have a limited future. Aside from the medical problems he cites legal difficulties and the fact that there will never be many spare hearts available. Dr. Kantrowitz asserts the future lies in the development of the artificial heart.

PROBLEMS WITH "THE LOOP." Doctors in London have warned that women who use the intrauterine birth control device commonly called "the loop" were likely to develop anemia. They said that after seven to twelve months the majority of women who used the device had iron-deficiency anemia.

EVOLUTIONARY DATING METHOD. A method of evolutionary dating that uses blood molecules indicates that man and the apes share a more recent common ancestor than usually supposed. In addition man is as closely related to the chimp and the gorilla as the two apes are to one another.



They tamed a wolf pack — or did they?

When Jack and Margie Lynch inherited a pack of gray wolves, Jack fed them armed with a gun. Today he plays and wrestles with 31 slant-eyed 200-pound four-legged “friends”—unless a fang-slashed jacket, crunched water bucket and tattered pants reflect a built-in instinct to kill.

Photos and text by George X. Sand

INSIDE a sprawling maze of wire mesh pens, Jack Lynch of Kane, Pa., stands surrounded by 31 huge gray wolves. On the roof of a hutch beside him, a 200-pound specimen

named Saber sits nose to nose with him, watching intently through icy, expressionless eyes that are set close together in a massive head.

Without warning, the wolf opens his 11-inch jaws and takes Jack's entire face into his mouth. The



This litter of wolf pups actually looks quite harmless, but even as puppies gray wolves have been known to play games that ended in death for all but the strongest.

two-inch fangs, however, hardly dimple the man's cheeks. An instant later, Jack's face is "washed" by the big animal's tongue.

"The biting gesture is a sign of deep affection," says Lynch. "A wolf never inflicts a real bite by mistake."

The Lynches are a handsome, childless couple in their early 40s. They were carefully selected from dozens of applicants by an aging Kane physician, E. H. McCleery, to take over the hobby to which he had devoted 43 years of his life:

preserving for posterity what he believed to be the last pure strain of "buffalo wolves" in the world.

According to zoologists, the buffalo wolf is a member of the common gray wolf clan—species: *Canis lupus*—who inhabited the southwestern plains and mountains of the United States in vast numbers prior to 1920. While far from extinct, they are now relatively rare in those haunts, due to severe decimation by cattle and sheep ranchers, as well as bounty hunters.

The parents of the Lynches' pack were obtained over the years from government hunters who spared, at the doctor's request, a few survivors of the fierce, cattle-killing



packs that had terrorized settlers and ranchers, and cost the U.S. an annual \$1 million for many years.

To ranchers, the wolves were intolerable. The Custer Wolf, one of the most famous—or infamous—of these wild canines, lived most of his destructive career with a \$500 price on his head. The story, which assumed apocryphal overtones—as most wolf stories seem to—was that this giant animal, who destroyed some \$25,000 worth of livestock in Wyoming and South Dakota during his active hunting life, was protected by a pair of coyote bodyguards. Oddly, the tale may be partially true. When a hunter named H. P. Williams killed

the two coyotes in 1920, the Custer Wolf's career came to an end. At least no further depredations were attributed to him after that. Regarding the role of the coyotes, however, experts who know wolves incline to the theory that they were more parasites than bodyguards.

Another infamous fellow carried the jolly sobriquet, "Butcher of Colorado." His depredations of cattle have carried estimates as high as \$56,000. The tale is told that he dragged down as many as 18 head of cattle in a single raid.

The big wolves killed so many cattle on Teddy Roosevelt's ranch in South Dakota that the President provided the best dogs he could buy

to wipe out the great beasts. There were nine of these powerful dogs, half Great Dane, half Bulldog. Yet they could muster only enough courage to rid the land of pups and small female wolves, as they accompanied the hunters on horseback. Should they get very far ahead of their human companions, the dogs would prudently return.

One night, after trailing a wolf all day, the weary men made camp and slept. That night the great wolf returned and killed all the dogs.

Some of these killer wolves hunted alone. They are not to be confused with the timber wolves and similar varieties. If the big grays moved into an area, most other wolves would leave at once. Should one gray meet another on the range, they frequently fought to death.

Today the Lynches' captive offspring of these fellows are fed 1,200 pounds of cow or horse meat in 50-pound hunks by Jack Lynch every five days. And they eat it in five-pound bites, ripping off and swallowing chunks—bone, hide and all. Basically, they are little different from their ancestors who once roamed free throughout the West. Given the chance and motivation, they will rip apart anything alive—without a trace of emotion in their cold, slanting eyes. This is characteristic of the sub-species, which has been labeled "lobo"—(Spanish for "wolf")—since the discovery of these animals during the settling of the West.

Yet Jack and Margie—starting this adventure with no knowledge



Margie Lynch, who with her husband Jack has raised the pack of gray wolves, proudly shows off one of her "adopted children," a beautiful, furry, slant-eyed animal.

whatever of wolves (the ailing doctor had died soon after their arrival)—have come to love "these guys" as they call their adopted children. In fact, Jack says, he is certain that if they hadn't accepted him as "one of them," the big gray beasts would have killed him long before this. They have had the opportunity.

Incredibly, Lynch has had some of them defend him against attacks by their mates. He has had his clothing torn to shreds, his boots ripped off, a tin bucket punctured by long, bared fangs as he used it desperately to ward off one attack. Some of the big boys weigh well over 150 pounds, have two-inch long teeth and an 11-inch bite.

When the Lynches first took over from Dr. McCleery, the going was rough. The doctor had grown too old to manage the animals himself, so he'd hired a keeper whom they



The bark is not worse than the bite in this case, for gray wolves seldom make noise, even when fighting another to death, but the 2-inch teeth can definitely be felt.



The Lynches call their four-legged friends "Lobos," which means wolf in Spanish. Although they had a few doubts when they began raising them, they now love them.

hated. Furthermore, some of them were sick. "For months I never went in those pens without a gun," says Lynch. They eyed him coldly, and he eyed them. "I was plain scared," he recalls.

Months went by before Jack was able to win the trust of a few of the older specimens. But as pups arrived (18 in a few years), both Lynches built up remarkably good relations with the newcomers. Unfortunately, only three of those early whelps grew beyond puppyhood. "Their mothers killed them," explains Jack.

To finance their hobby, the Lynches exhibit the wolves to passing motorists. Activity and noise of people passing through every day made the mothers nervous. Their milk dried up and rather than see their pups die of starvation, they destroyed them.

In order to save the three that did survive, Lynch and his wife did a risky thing. They took the freshly born pups from the mother and fed them by hand—starting with an eyedropper; working up to bottles.

"The old lady was a hazard for awhile," Jack admits. "She'd have killed us if she had had a chance. Steal a mother wolf's pups and you usually have a lethal enemy for life.

"We gave them back to her as soon as they were weaned, and she carried them in her mouth for days. She never *really* forgave us."

Since then, the Lynches have constructed dens where bitches can whelp in seclusion, and more than a dozen pups have been raised by their own mothers. These animals—now mature wolves—are very nearly pets. But not quite!

Lynch accepts the fact that a

human can never be totally accepted as a "lobo's" master. But he is convinced one can earn their respect, and, to some degree, their friendship. He survives, he says, because he has taught himself to see these wolves as human in many of their actions. They will, for example, show quick resentment to an affront.

He recalls the time he was bent over, repairing one of the wire pens (a never-ending job). A big male sneaked up behind the powerfully-built man. Before Lynch knew what was happening, the beast had deliberately closed its great jaws over one of his hips. But it didn't bite. . . .

Then, while Jack remained rigid, helpless in his awkward position, the great wolf gently repeated the strange performance at his opposite hip. "He was just giving me a warning reprimand for a boo-boo that I'd pulled a few minutes earlier," Jack says with a grin.

Lynch has yet to shoot at one of the animals. Once two of them backed him into a corner so tightly he couldn't draw the heavy revolver at his hip for emergency use.

The wolves mate for life. They fight to the death without hesitation if not separated into pairs in individual pens. The fight is always a silent one to the finish. There is no growling or snapping as there would be in a dog fight. The eyes remain bleak, expressionless throughout the show—a matter of standing half-crouched, taking great chunks of flesh out of each other until one drops. Even as puppies,

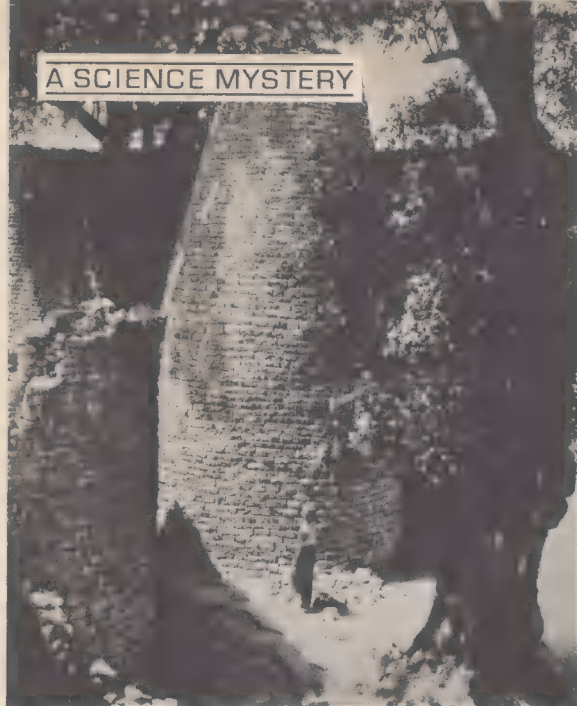
the "lobos" will play at such deadly battles, chasing one another grimly as did their ancestors. Those that are caught are sometimes eaten by the pursuers, leaving only the strongest of the strain to remain (sometimes but one puppy). The parents watch this sport with interest, refusing to interfere. They have no love for a young wolf that doesn't enjoy fighting.

In fact, a young wolf will kill his parents, given a reason. If the young are removed from the pen at an early age, the man doing this removing must be some outsider hired for the job—not the Lynches. And he must never return. The wolves will remember him and resent him.

These magnificent animals are living engines of destruction. For centuries they maintained the balance of Nature in the early West by following the great buffalo and antelope herds, preventing these animals from overrunning the range and destroying all the food. In the wild, their practice is *not* to kill wantonly (though a few undoubtedly have done so), but to take the cripples and weaklings. When human hunters finally destroyed the last of the buffalo herds, the wolves made a switch: they proceeded to kill horses, cattle and sheep.

In spite of the grim danger constantly afforded them by their "children," the Lynches appear to be having a ball as they exhibit their wolves for public inspection in steel wire enclosure pens six miles east of Kane, Pa., on U.S. Highway 6.

A SCIENCE MYSTERY



In what is today Rhodesia, there is a ruined fortress called Zimbabwe. No one knows who built it, but the most fabulous tales have been told to account for it. Today it remains one of the most fascinating and controversial places in all Africa.

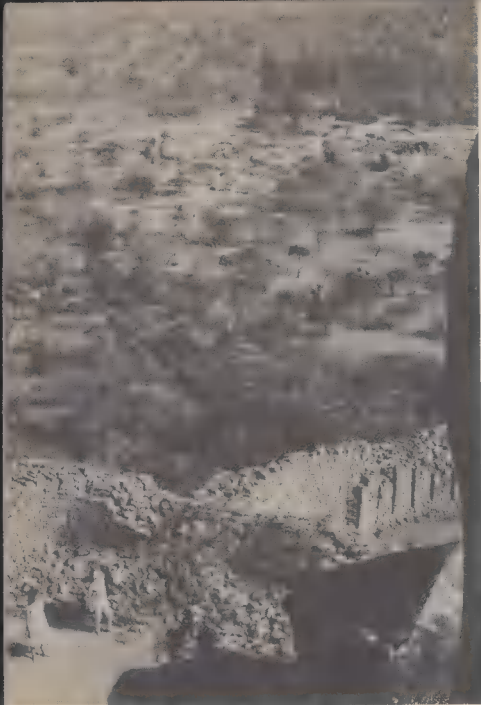
Secret of Zimbabwe — search for King Solomon's mines

by L. Sprague de Camp

THE 1850s and '60s were a time of mighty stir in Africa, as the explorers Burton, Speke, Stanley, Baikey, Livingstone and others plunged deep into the hitherto unknown interior. Although Europeans had long been settled along the palmy shores, most of the African hinterland was still almost as

mysterious as the Martian surface or the other side of the moon.

The interior of sub-Saharan Africa, however, had remained inviolate, because nature had hedged it with formidable barriers. The Sahara Desert guarded it on the north, save where the narrow corridor of the White Nile snaked across the desert. But the ascent of the Nile was blocked by enormous swamps



The main ruins of Zimbabwe are on the top of a steep-sided hill and spread out for about a quarter of a mile. Smaller, similar ruins are scattered through a wide area.

—the *sadd* of the southern Sudan.

South of the Sahara, the coasts were mostly flat tidewater plains, swampy and heavily forested. The uplands beyond were delightful, but to hack one's way through these insect-swarmed, disease-ridden jungles was a task to daunt the stoutest adventurer.

The problem was aggravated by the tsetse fly, whose bite was fatal to all beasts of burden. Because of the fly, man had to do all the carrying. And man makes an inefficient beast of burden. An average man can carry only 60 or 70 pounds for long distances, compared with 200-300 pounds for a horse and 400-500

pounds for a strong camel.

So these coasts presented an almost insuperable logistic problem. Even if the explorer did not succumb to disease, accident, desertion or hostile spears, the amount of supplies and trade goods he could carry limited his range to a few score miles inland.

These barriers isolated Negro Africa from the main cultural currents of the Old World almost as completely as the oceans isolated the Australian aborigines, the Pacific islanders and the American Indians. This isolation explains the cultural backwardness of the African Negroes, just as it explains that of the Polynesians and the Amerinds (American Indians).

In the extreme south, climate and topography were easy, but the native Bushmen and Hottentots were among the world's most primitive peoples. These "Bushmanoids" could offer no serious resistance to invaders. Here the main barrier to European penetration was simple distance. As the ocean-going ship was perfected in the 16th and 17th centuries, this factor no longer mattered, and in the 18th and 19th centuries, Europeans overran and settled South Africa from the south, just as the Negroes invaded it from the north.

Between the Bushman-Hottentot area of South Africa and the Sahara dwelt various Negroid peoples: the tall, lean, cattle-raising Nilotes of the southern Sudan; the slender, sharp-featured, curly-haired Erythriotes of the Sudan and Ethiopia; the Pyg-

mies of the northeastern Congo; and the burly Forest Negroes elsewhere. Archaeology indicates that, during the last few thousand years, the larger sub-races of the Negroid race have vastly expanded at the expense of the primitive hunters—the Bushmanoids and the Pygmies. By the 19th century, some Negroid peoples had achieved a state of semi-civilization, comparable to that of the Egyptians and the Sumerians five thousand years earlier. They had farming, cattle, weaving, pottery, metals, stone buildings, large towns and large-scale government. Some were even beginning to experiment with their own systems of writing.

In South Africa a century ago, rumors of great, glittering inland cities, living or dead, ran riot among the encroaching whites. Back in the 16th century, the Portuguese had published reports of a vast empire between the Zambesi and Limpopo rivers, ruled by a sovereign called Monomotapa, who reigned from a capital called Symbae or Zimbaoche. In the 17th century the Portuguese reduced the Monomotapa to a powerless puppet, although a family still claimed the empty title down into the 19th century. But, in the uncritical minds of hunters and miners, all these tales swirled together to form a vision of a golden metropolis of gleaming towers and palaces, where an enterprising man would find a fortune ripe for picking.

In 1871 an unusual man appeared in Mashonaland, in southern Rho-

desia. He was Karl Gottlieb Mauch, a 34-year-old Swabian geologist who had worked his passage to Africa to make his mark as an explorer.

After hiking widely over South Africa, usually by himself, Mauch in 1871 found himself at the end of his tether. Half starved, he was threatened with captivity by a chief named Dumbo, who had poisoned his beer in order to rob him. Just in time, another big, strong white man turned up to ransom Mauch. The newcomer was Adam Renders, a German-American trader and ivory hunter. As a result of a scandal, Renders had deserted his family and plunged into the wilds of Mashonaland.

Camped at ruins

Mauch, delighted to find another German-speaker, confided that he hoped to crown his work by exploring the ruins of the ancient seat of the Monomotapa. He had heard about it from a German missionary named Merensky, who had heard about it from a native chief. Easy, said Renders. He had not only heard Merensky's tale, but had actually camped at the ruins during his elephant hunts.

Learning that an old acquaintance, another ivory hunter named Philips, was nearby, Mauch sent a message to fetch him. Then Renders, Mauch and Philips went to the site and spent several days scrambling about the ancient masonry.

Mauch returned to Germany and published a book about his discoveries. He concluded that the rites of a local native cult were of Semitic origin. He fancied that the ruins were the Ophir of the Bible, whence (according to I Kings 9:26) the ships of King Hiram of Tyre fetched over 12 tons of gold to King Solomon. In fact, said Mauch, the building on the hill was an imitation of King Solomon's temple on Mount Moriah, while the large elliptical building in the valley was a copy of the palace in which the Queen of Sheba had stayed when she visited Solomon. He even asserted that the ruins had been the residence of Queen Bilqis herself, who had brought Phoenician workmen thither to erect the buildings.

The wealth of "Ophir"

Everywhere the name "Ophir" conjured up a picture of hidden wealth. No matter how leaky Mauch's theory, the word "treasure" touched off another gold rush. A stream of soldiers, explorers, adventurers and archaeologists headed for the site, whose name, after passing through many guises, received its modern form "Zimbabwe" from the hunter Frederick C. Selous.

In 1889, Cecil Rhodes organized a British company to settle the lands north of the Dutch-settled Transvaal and named the new country Rhodesia after himself. Armed settlers and company police poured in, at first peacefully. When the Africans saw they were losing their

country, they fought. But all—warlike MaTabele and peaceful MaShona alike—were crushed.

At the height of the gold fever, a group of treasure hunters got a franchise from Dr. Leander Jameson, the adventurer associate of Rhodes, for an Ancient Ruins Company, with the exclusive right to prospect all the ruins in Rhodesia for gold. In the next few years, these scoundrels devastated forty-odd sites, especially Zimbabwe. They got a few thousand dollars' worth of gold, but they also removed ancient relics, confused the stratigraphy and contaminated the sites with modern objects like liquor bottles and broken umbrellas. The sites were not legally protected until 1902, when R. N. Hall was appointed curator of Zimbabwe.

Zimbabwe lies in the valley of the Mapudzi River. This is a broad, rolling valley broken by granite hillocks of many shapes. The countryside is typical African parkland, with loosely scattered groves and single trees. It has a moderate rainfall with dry winters (June to August) and wet summers. Animal life is much sparser now than it was in the days of Renders and Hall.

The ruins are on top of a steep-sided knoll, Zimbabwe Hill, and spread out over a quarter of a square mile south of this hill. The ruins consist of the so-called Acropolis atop the hill; an oval structure, the Temple or Elliptical Building, 600 yards south of the Acropolis; and about a dozen smaller structures, the Valley Ruins, north and

*Dubious theories about the origins of the ruins
touched off a gold rush which nearly destroyed them.*

east of the Elliptical Building.

The Elliptical Building consists of a massive, roughly elliptical wall, about 220 by 280 feet in diameter and 830 feet around. A few small walls lie outside the ellipse, and within it a number of smaller walls run hither and yon among platforms and towers. All these walls are of dry-wall masonry, made by piling up small blocks of granite laid in courses. The blocks were obtained with a minimum of shaping from nearby hillsides, where the granite had cracked off from boulders and ledges in layers like those of an onion. The builders used no mortar but plastered the lower parts of the walls with a sand-lime cement.

The walls have a pronounced batter—that is, a taper from bottom to top. They are neatly rounded at the ends, and drains at the base of the main wall let water out of the enclosure. All the walls have suffered from the ravages of time.

The outer wall is still in fairly good condition. Having lost a foot or two of the topmost courses, it is still 20 to 33 feet high. At its thickest, it is 15 feet wide at the bottom and 10 feet wide at the top. It has three main entrances. The wall is rounded off on each side of these entrances, and a kind of stile of stone steps passes through the entrance. Flanking each portal is a pair of cylindrical structures, often

with ax grooves that once held some sort of gate.

The interior walls form several enclosures and long, labyrinthine passages. At the southeast side of the main enclosure stand (or stood) two conical stone towers. The larger is 30 feet high; it was five feet higher until Mauch, thinking there might be a crypt inside, climbed to the top and began throwing off stones until he convinced himself otherwise. The smaller cone, less than half as high, was pushed over by a tree growing beside it, so that only its stump remains.

The Acropolis is atop a 90-foot precipice on the south side of Zimbabwe Hill. It is a congeries of curving walls, which incorporate the many outcrops and boulders occurring naturally on top of the hill. Access is by several narrow, winding, easily defended passages. A cave below the walls of the Acropolis has strange acoustics. A man speaking naturally in the cave can clearly be heard in the Elliptical Building, a quarter-mile away, but nowhere else in the valley. Doubtless the native priests put this phenomenon to nefarious use.

The remaining Valley Ruins reproduce on a smaller scale the features of the two main buildings. Other smaller but similar ruins lie scattered about Rhodesia, Mozambique and Bechuanaland.

The MaShona of the Zimbabwe

area are rather slender, athletic Negroes speaking one of the many Bantu tongues. Most of the early explorers found them polite, good workers and reasonably honest, but timid, having lost their courage from being raided and massacred by more warlike neighboring tribes.

If the unmarked stones of Zimbabwe could speak, they could tell us who piled them up and when and why; but they cannot. In the absence of written records, the history of Negro Africa is inevitably vague and sketchy before the coming of the whites.

Spread of Negroes

Between 1000 B.C. and 1000 A.D., the Negroes learned the arts of agriculture, cattle raising and iron working. These advances enabled them to spread out over a vast area at the expense of the Bushmanoid and Pygmy hunters. The Bantu—a linguistic subdivision of the Forest Negroes—are believed to have reached Rhodesia from the north some time after 500 A.D. By the time of this Bantu movement, the Arabs had already set up trading posts along the east coast of Africa as far south as Zanzibar. Some of these posts grew into thriving city-states, which fought viciously among themselves and could not even unite to resist the conquering Portuguese of the Age of Exploration. A mixed Arab-Negro race grew up along the coast, speaking a kind of Basic Bantu with many Arabic words, which we know as

Kiswahili or (less correctly) Swahili.

When the Portuguese reached Rhodesia around 1570, marching inland from the Arab cities they had conquered, they found Bantu miners mining gold, silver, copper, iron and tin. They also found the Monomotapa ruling a large and fairly orderly empire, with its capital at Zimbabwe, and trading gold, slaves and other exports with the Arabs.

In 1629, the Portuguese forced the Monomotapa to accept their "protection." His empire crumbled because the intensification of the slave trade disrupted mining and other normal activities, and more barbarous tribes then invaded the land.

Mauch's speculations about King Solomon's mines loosed a flood of theory about Zimbabwe. Dr. Carl Peters, the German explorer, thought Zimbabwe was the land of Punt, with which Egyptian monarchs traded.

J. T. Bent, who dug at Zimbabwe in 1891, thought the ruins had been built by Arabs, Phoenicians or some such Semitic people. R. N. Hall also thought the ruins were Arab. Others proposed the Dravidians of southern India or the Malays as the builders of Zimbabwe.

Zimbabwe had the bad luck to get involved in the 20th-century dispute over the differences among the races of man. Those who wanted to prove the Caucasoid or white race superior to the Negroid were eager to show that Zimbabwe

Those eager to show the white race superior asserted that Zimbabwe had not been built by blacks.

had been built by whites—or at least not by blacks.

Later and more scientific excavations at Zimbabwe—those of David Randall-MacIver in 1905 and of Gertrude Caton-Thompson in 1929—showed that Zimbabwe was much more recent than the more romantic theories had assumed. They also indicated that the naked Bantu had built the structures after all. From the fragments of Chinese and Persian trade goods he found, Randall-MacIver thought that Zimbabwe had been built about the 15th century of the Christian Era. Miss Caton-Thompson put the date earlier, in the 9th or 10th century. She pointed out, moreover, that the ruins were not near any known gold deposit and so could hardly have been built as a gold-mining center.

Finally, a log used as a lintel over a drain in the Elliptical Building was tested in 1950 by the radiocarbon method and was found to have been put in place about the 7th century of the Christian Era. So, while Randall-MacIver gave the ruins much too late a date, they cannot possibly have had anything to do with King Solomon, because they were built at least 1,500 years after his time.

As the picture looks now, an early wave of the great Negroid expansion reached Rhodesia from the north about the 6th or 7th century of the Christian Era. The

invaders mixed with the native Bushmanoids and taught them their own early iron-age peasant culture. Their descendants built Zimbabwe and similar centers. The Elliptical Building was probably a royal compound, divided into compartments for the king's cattle, women and servants, or a combination of compound and temple. The Valley Ruins were the compounds of sub-chiefs, and the Acropolis was a fortress.

Meanwhile, Asian traders—Arabs, Persians and perhaps Indians—were extending trading posts down the coasts. In time the Zimbabweans learned to mine gold to buy trade goods from these posts. Later waves of Negroid migration submerged the original builders; Zimbabwe was probably abandoned, reoccupied and rebuilt several times. The last rebuilding may have been as late as the 18th century. In the 19th century it was abandoned for good, although the local tribes tried for a while to keep up the religious cult that had centered there.

Much more we cannot say. Although archaeology will probably settle many doubtful points of African prehistory, the detailed history of Zimbabwe, lacking written records, is probably lost forever. As Miss Caton-Thompson wrote: "Zimbabwe is a mystery which lies in the still pulsating heart of native Africa."

Food irradiation 'zaps' longer life

A cellar full of potatoes shot with 15,000 "rads" of radiation may soon pave the way to commercial irradiation of food, and with it, longer lasting and possibly even larger growing food products.

by Bob Nein

SEVERAL times a week Dr. George Pigott steps into a cellar on the University of Washington campus in Seattle. Switching on the light, he checks the condition of a giant mound of potatoes.

Pigott is an assistant professor in the UW College of Fisheries. Why is he riding herd on 20 tons of spuds?

The reason, sitting a block away in the Fisheries Building, is a Cobalt-60 Mark II irradiator. It has already "zapped" half of Pigott's cellar full of potatoes with up to 15,000 "rads" of radiation.

The unit is one of four Cobalt-60s in the nation owned by the Atomic Energy Commission and placed in universities to perform irradiation research. At the Seattle school it has been extremely busy for five years; first with seafoods, now with potatoes, wheat and other field crops.

It has company nearby. This fall, Washington state became host

to three more irradiators, in what must be the country's most intensive double-barrelled food irradiation program.

One approach is research; the other public acceptance. Together they're speeding the day when U.S. consumers will routinely be eating commercially-irradiated seafood, potatoes and dozens of other foods.

"Research has already shown how irradiation improves the keeping quality of many fruits, vegetables, seafoods and meats," says ex-Navy officer Donald A. Kock, director of the state's Office of Nuclear Energy Development.

"Now we're trying to open some new doors in the food irradiation field," he says.

The doors open slowly.

Scientists at MIT, the University of Louisiana and the University of Washington began AEC-sponsored irradiation tests on seafood five years ago. The resulting petition for Federal Food and Drug Administration approval was submitted in 1965, but the request is still pend-

ing before the FDA.

Progress is slow because Food and Drug insists that all irradiated foods must run a gauntlet of exhaustive animal-feeding tests for safety. Thus far, only three items have passed: bacon can be sterilized with up to 5.6 million rads, and low exposures are permissible to control insect life in wheat and inhibit sprouting of white potatoes.

"That's one reason we began to test items which didn't require FDA approval," says the University of Washington's Dr. Liston.

With the state's Department of Commerce behind them, Liston and his food science colleagues began in 1965 to explore possible new uses of irradiation with farmers and food processors. Not all the products they treated were edible.

"We irradiated fish bait, bulbs and floral greens, all fairly important industries here," he says.

Scientists are still seeking the right combination for improving keeping quality of these items. King crab fishermen in Alaska will test Washington-irradiated herring for bait this winter.

But with wheat and potato seed, they may be onto something important in another irradiation use—growth stimulation.

"We've irradiated both wheat and potato seeds with doses up to 1,500 rads," says Pigott. "Our preliminary tests indicate increases in root growth, foliage and yield of the product."

The university's first major test plots proved inconclusive this year

because of Washington's drought-stricken summer, the driest since 1893. But the UW food scientists hope to nail down valuable yield statistics next year, using both small plots and 50-to-100-acre commercial plantings by farmers.

If seed irradiation proves out, it could offer big benefits for growers and processors: faster growth, shorter growing season and increased yields.

But potatoes and wheat flour grown from irradiated seed won't reach U.S. kitchens without clearing yet another hurdle. First, FDA officials must certify safety and nutritional value.

20 tons of spuds

That explains the 20 tons of spuds now stored in the University of Washington's cellar. If a proposal now before AEC is approved, UW food scientists will carry out chemical, biochemical and microbiological tests comparing the composition of wheat and potatoes grown from both irradiated and non-irradiated seed during the next year.

"Should this research result in federal approval, it will be a tremendous forward step toward commercial irradiation," says Dr. Pigott.

The first known commercial effort is a million dollar plant at Allentown, Pa., announced by Irradiated Foods, Inc. It is being built with government financial help, however. How far away is the

first purely commercial radiation plant?

"Several firms tell us they're extremely interested in the market," says Dr. Pigott. "I believe we'll have a commercial plant in the Northwest within 18 months."

A traveling demonstration

A sizable investment per plant—from \$200,000 to \$1 million—would be required. Since about 25 percent of this investment lies in the cobalt or cesium source, it's likely that mobile sources, transportable to several stations, would be used.

To smooth the way for such commercial operations, the state Nuclear Development office is turning the food industry on to irradiation ... with a traveling demonstration.

In October, Washington became the first long-term user of the AEC's new mobile demonstration unit, a cesium 137 irradiator mounted on a 30-foot truck-trailer. The unit will tour the state's farm industry communities for six months until April.

"Taking the mobile unit directly to farmers, processors and shippers gives them a better understanding of what irradiation really is," says assistant nuclear director Larry Bradley, who is coordinating the irradiator's Washington State tour.

"The processor is seeing his product treated at his plant under his conditions. He discovers, first, that irradiation is perfectly safe; and

second, that it has potential benefits for his business," says Bradley.

Hopefully the unit will increase public understanding too. "At least we'll be aiming for that with publicity and school demonstrations," says Bradley.

It is in the seafood industry that benefits for processors and consumers are probably the greatest. Research at Seattle and Gloucester, Mass., shows that irradiation can extend the shelf life of refrigerated fish, now a week at most, to as much as 28 days.

This promises greatly expanded markets in the American Midwest, and around the world, for West and East Coast fisheries. Many supermarkets which now refuse to handle fish because of spoilage experience would find the cost of irradiation (two to five cents per pound) a real bargain.

Long lasting fish

They can count on additional sales. Fish will become, like meat, an item a housewife buys on the weekly shopping trip. She will prepare it for the family's dinner when convenient, rather than having to cook it immediately or risk spoilage.

The best way of irradiating seafood is still a matter for research. One question yet unanswered: would irradiating fish at sea make a big difference?

This is of great interest to David Miyauchi, a slender microbiologist at the U.S. Bureau of Commercial

*Irradiating fish while still at sea is process
scientists hope will lessen seafood spoilage.*

Fisheries in Seattle. Miyauchi is leader of a new AEC research project using still another Washington-based irradiator, the nation's only shipboard model.

The unit was recently installed aboard the Bureau's new \$4 million research ship. Equipped with biological, oceanographic and electronic laboratories, the 215-foot vessel will cruise from Baja California to the Bering Sea in search of scientific data.

"We know that freshly-caught fish have a low bacteria count. But by the time a fishing boat returns to port, the count has risen considerably," says Miyauchi. "By irradiating at the peak of freshness, it should take a much lower exposure to get high-quality fish to the market," he theorizes.

The fisheries' scientists will experiment with a double exposure irradiation—a low dose of about 50,000 rads at sea, then a higher dose later on shore.

The shipboard project will also test these variables: interval between landing the fish and irradiating it, level of exposures and irradiation before and after packaging fillets.

"Packaging in oxygen-tight containers has proven to be very important in preserving some seafood varieties," he says. "Contact with air can turn certain fillets rancid in 7 to 10 days, but they keep three

to five weeks if packaging is right."

The irradiation-at-sea project will concentrate on commercially important West Coast bottom fish: ocean perch, sole and cod.

First priority, Miyauchi points out, is the scientific feasibility of shipboard irradiation. "If there is only a small benefit, why bother"? But even if a major improvement in keeping quality is proven, there will still be the question of commercial feasibility. Will it pay?

Preserved pork chops

In October the ship was being equipped to search for new irradiation knowledge. At the same time, an educational unit in Seattle was helping to teach students some of what is already known.

This fourth member of Washington State's irradiation quartet is part of the AEC Life Science Radiation Laboratory, which attracted record crowds to Seattle's Pacific Science Center all summer and fall.

Six school tours per day watched irradiation tests, peered at long-preserved irradiated pork chops and took home irradiated seeds to plant.

"To my generation, a pound of bacon zapped with nuclear radiation is something of awe," said a technician watching a milling group of teen-agers. "When they marry, these girls will serve it to their families without a second thought."



Dr. Abner Weisman examines one of the 3,000 sculptures he has collected. This one he keeps on his desk pointing out to his obstetrical patients that good teeth mean good nutrition. More show women deformed from having too many children on a poor diet.

The “diseased” statues of ancient Mexico

From the amazingly accurate details of these clay figures a New York doctor can diagnose the diseases Indians had over 1,500 years ago.

by Bruce Frisch

THE sandflies bit hard in ancient Peru, and the mothers of Mexico didn't drink their milk. Al-

though only a few of the Indians of the Americas had a written language, they have told us these things much more graphically with stone and clay sculptures so ac-

curate and detailed they may have been used to teach medicine.

"See the way part of the upper lip and the bottom of the nose are eaten away on this one? That's probably *leishmaniasis*. It's carried by the bite of the sandfly. It's still found in the lowlands of Peru. You don't see it in the mountains, because the fly doesn't get up there," said Dr. Abner Weisman, pointing toward a drinking vessel. Three thousand other figures jammed shelves covering the whole top floor of his New York brownstone and overflowed onto a baby grand piano. Two thousand portrayed physical abnormalities, making it the largest biomedical collection of pre-Columbian art in the world, and one of the largest general collections.

"You have to see a lot of normal figures before you can say one shows an abnormality," said Dr. Weisman, who is professor of obstetrics and gynecology at New York Medical College. "Some tribes showed everyone with short arms or long noses. Some put short legs on all the religious figures being carried on pallets, apparently just because it was more convenient."

With the enthusiasm of a man who gets up at four every morning to work on his collection, Dr. Weisman explained that civilized American Indians were prolific sculptors, but most figures were of gods. Two major peoples, however, had religions that centered on the moon and sun. These, the Incas and pre-Incas of Peru and the Colima-Jalisco-Nayarit tribes on the west

coast of Mexico, fashioned human beings engaged in everyday living.

"There are three other clues to ancient disease. First there are bones. Bones just tell you about bones. From them we know some Indians lived to a ripe old age, but the expectancy was 35 to 40 years for most. Second, there are mummies, which give you some flesh. They are found only in Peru. In other areas the ground is too wet to preserve the bodies. Third, are writings. Most Indians did not have a written language."

Major causes of death were childbirth, war and intestinal infection in early infancy. "And there were probably very, very intense epidemics. They had very few public health measures. One they did have was when someone was sick. They would burn his house down with him in it.

"I doubt syphilis existed here before the Spanish came. The supporters of the New World origin of syphilis contend that almost all the people of Hispaniola where Columbus finally landed—the island now divided into Haiti and the Dominican Republic—suffered from sores called *las bubas*, and that Columbus' crew contracted the disease there and brought it back to Spain and Portugal in 1493."

Figures dug up in Mexico are entirely covered with skin lesions. Archaeologists, artists and anthropologists have diagnosed some of these as syphilis. "Not satisfied with all this, I invited three fully qualified skin specialists here to ex-



amine specimens." The experts did not find a single case of syphilis. As a result, Dr. Weisman goes along with the explanation of a British physician, Dr. Ellis Hudson, who claims a whole series of diseases are caused by the same parasite, *treponema pallidum*. *Treponema* adjusted slightly to the varying living conditions of its host, man, and each slightly different strain produced a slightly different disease, says Dr. Hudson. Under hygienic European standards, a strain evolved that could only be transmitted by sexual contact, and that form is syphilis.

Although the Indian did not have penicillin to cure the American forms, yaws and pinta, he did have

an amazing array of drugs.

"The Indians were the world's greatest pharmacologists, along with the Chinese. From them we have got quinine for malaria, cocaine, mescaline, peyote, curare and others."

They were also good surgeons, but the Hindus and Egyptians were better. It was against the religion of the Chinese to cut the body.

With his obsidian, or volcanic glass, instruments, the high priest of the American Indian opened the chest faster and more skillfully than modern heart surgeons, since he practiced on thousands of captives. He then reached inside to pull out the still beating heart and held it high for the approval of the gods.



Likewise, some Peruvians may have had the skill of a brain surgeon in cutting through the skull, but for no more helpful a purpose than the "freeing of inner demons or evil spirits." The surprising thing is that patients survived. Many pre-Inca skulls show two and even three openings partially filled with new bone growth.

Not all the Indians' surgical knowledge was useless; they could pull teeth and cut abscesses. They could also set broken bones and hold them immobile with splints. Proof of the results has been found in skeletons with fractures that have healed with little or no overlapping.

Amputees are often shown on

A rolled cloth raises the knees to ease swelling in the legs of a woman probably suffering from phlebitis, left. The same treatment would be used today. Center, is a case of phocomelia—a "thalidomide baby" before thalidomide. Right, a man pulls hard for breath during an asthma attack. Binders keep a woman restrained to her bed, below, during a violent mental spell.



Peruvian drinking vessels. Whether a leg was removed as therapy or punishment is not clear.

While it is tempting to interpret Mexican figures having incisions running the length of the abdomen as evidence of life-saving operations, the more probable likelihood is that they show sacrificial disembowelment. Such incisions appear in pregnant women modeled in Guerrero, Mexico. Though not grisly sacrifices, it would be romantic to believe they are cesareans. "Recently a Mexican anthropologist pointed out to me that these . . . were probably fertility figurines. They have been found in lines or rows in corn fields buried a few feet below the topsoil. He felt that farmers had planted these specially incised figures in the field to insure a more fertile and fruitful corn crop."

Harelip a gift from gods

Childless women seeking fertility drank from jugs adorned with twins. In other tribes, however, twins meant the wife had been unfaithful, and one had to be killed.

"Now look at this one," commanded Dr. Weisman, putting down a figure of a woman holding a cradle board with a child on it. A cloth covered the baby from the knees up, and the woman was holding it in place over the face. "Is she protecting the child from insects with a netting," asked Dr. Weisman, "or is she smothering it?"

Other Indian mothers were anx-

ious to give their children a little extra push toward success. Figures in his collection appear to Dr. Weisman to show possibly a brace put on a child to produce *kyphosis*, a curving of the spine into a humpback. If humpbacks got preferred treatment, perhaps because they were thought to have been touched by the gods, the mother would have been assuring the child's future, Dr. Weisman speculates.

In western Mexico many figures have been found with harelip-cleft palate. But out of 2,000 skeletons studied, only one had a defective palate, points out Dr. Fernando Ortiz-Monasterio, chief of the department of plastic surgery at the University of Mexico. The defect may have been considered a gift from the gods, too, he suggests.

"Most pre-Columbian figures are dug up from graves," continued Dr. Weisman. "The grave of an average person has 30 to 40 figures. They could be his treasured possessions. Or they may be effigies of relatives, friends and neighbors to accompany him on his travels beyond. They also may be fertility symbols through which his body would seed other human beings.

"In Mexico the farmers turn them up when they are plowing. I would go into their homes and there would be hundreds around the room. But only about one in 500 shows a medical abnormality. I might pick out one or two.

"My interest started when I was a public health surgeon with the Sioux in North and South Dakota

Indian mothers may have strapped some children into a brace to curve their spines into humpbacks.

about 30 years ago. I was called wombli tonka—big eagle. Tonka means big. When they were kidding me, they would say, 'You no wombli tonka, you tahzi tonka,' big belly.

"A few years later I went on a lecture tour in Mexico and Central America for the International Fertility Council. One time I was staying with a doctor outside Mexico City. On Sunday morning he asked if I wanted to join them in rifle and pistol practice out back. They had a sort of hacienda. I wandered out, and there they were shooting at these clay figures. I asked, 'Why do you use these pieces of art? Why don't you use tin cans?' 'Oh,' he said, 'We have so many of these figures and not enough tin cans.'

"I took home a few valises full that time. I used to come back with a hundred figures at a time. Nobody cared. Now, no more can come out. There are still lots. They haven't touched the surface."

Dr. Weisman caught the collecting bug so badly he once spent 15 years hunting examples of a figure tied down in bed. He had read about it in a report by Henri Lehmann, the curator of the Museum of Man in Paris, who had managed to examine 13, six from his own museum and the rest from several other places. Lehmann's conclusion that the figure was ill sent Weisman on their trail until he had

gathered 48. He then sat down to study them.

All but one, he noted, were women. A number had bow legs and other deformities. He diagnosed *osteomalacia*.

"The cause of *osteomalacia* is the occurrence of repeated pregnancies without sufficient replacement of calcium and other bony constituents. Each succeeding pregnancy results in a gradual softening or decalcification of the bones, with eventual inability to walk and final resort to bed."

As to the straps, "Is it not possible that these patients—with or without *osteomalacia*—may have suffered extensively from postpartum psychosis and later menopausal psychosis? In a violent state they might have been treated with restraining binders."

There is more evidence of mental illness among the Indians in two-headed figures, "most likely schizophrenics. One head's the good side of the personality. One's the bad."

Dr. Weisman leaned out of his chair and plucked another sculpture off a shelf. It was a woman holding her head. "And anxiety. It goes way, way back.

"Let me tell you," he snapped, shifting his cigar in readiness to drive home his point. "After all my studies I have come to the very unspectacular conclusion that man doesn't change."



What causes those Giant Waves

Destructive tsunami waves are caused by underwater earthquakes, pictured above, and are often mistakenly called tidal waves. Tsunamis are devastating; so are other vicious waves.

by William Kreh

AFTER Hurricane Beulah vented its fury on the Texas Gulf Coast last September, pounding wave after monstrous wave on the battered shore, survivors called it one of the worst storms of the century. Total damage from the wind and waves was estimated at \$1 billion.

Yet the waves caused by this hurricane, or any hurricane, as bad as they are, are by no means the largest or most destructive. Some waves

have nothing to do with storms at all.

For countless ages, man has watched waves at sea and from the shore with a mixed reaction ranging from awe and admiration to sheer terror. Yet he has really understood very little about them.

What causes them? Where do they start? Where do they go? How do they get there? And, most important, how do they build up to such tremendous heights and destructive power?

The great waves that hit Galves-



ton in 1900, since immortalized in the folk song, *That Was a Mighty Day*, killed 7,000.

Another hurricane that poured wind and water on Florida and the West Indies in 1928 left 4,000 dead.

In 1946, with no warning, the town of Hilo in the Hawaiian Islands was hit by a series of 50-foot waves that ripped homes, tore up railroad tracks, demolished steel bridges, washed away beaches and killed more than 150 persons.

On a sunny, clear day in 1958, 30-foot crests suddenly tore out of the Atlantic Ocean onto the island of Barbados in the West Indies, hurling fishing boats onto the beaches and destroying homes along the coastline.

In 1966, while riding out a storm, the Italian liner *Michelangelo* was severely damaged by a freak wave

that smashed bridge windows 81 feet above the waterline and killed three persons.

And death-dealing waves aren't always confined to open seas. In 1954, Lake Michigan suddenly sent a giant wave roaring in on a peaceful Chicago beach, sweeping seven fishermen to their deaths.

These are just a few samples of the destructive qualities of killer waves.

Just what are waves? When you watch them, they appear to be huge mountains of water rolling across the top of the sea. This is just an illusion. Actually, only the wave *form* moves forward. The water itself merely moves up and down. It's like cracking a whip. The ripple runs down the whip, but the in-

Reprinted with permission from Popular Mechanics © 1967 the Hearst Corp.

dividual parts of the whip don't move forward at all, just up and down.

What sets off nature's watery whip?

Many things. Wind is the main cause, the most violent winds, of course, occurring in storms. But there are other causes, including underwater explosions, such as earthquakes or volcanic eruptions, or even the topography of the body of water itself.

Wind waves

Let's start with wind waves. Waves can be created by winds as low as four m.p.h., but there are other factors involved besides velocity; namely, the duration of the wind and the distance over which the wind is able to act on the surface of the water. Seafarers usually refer to this distance as "fetch."

In other words, a wind wave is the product of the velocity, duration and fetch of the wind. Storms, especially storms that go on for several days, usually produce the greatest velocity and longest durations, but not necessarily the greatest fetch. Storms are generally localized, but winds, not necessarily in storms, can and do produce fetches across the greater part of an ocean. Consequently they can produce waves of even greater destructive force than those made by local storms, including hurricanes.

The liner *Michelangelo*, mentioned earlier, probably encountered such a wave. It had been running

in strong winds that produced waves an average of 30 feet high from trough to crest. Suddenly, it was struck by a wave that hit its superstructure 81 feet above the waterline. Wave experts believe such a wave could have been predicted. Waves in rough seas, though not necessarily in storms, average out in height, they say; some higher, some lower than average. But if the rough seas and waves persist long enough, one in 20 will be much higher than average, as much as 2.2 times higher. Such a wave probably hit the *Michelangelo*.

Waves of 60 feet are considered quite common in North Atlantic storms. Probably the best-measured and largest wave ever encountered, however, happened in the North Pacific in 1933. For seven days a Navy oiler, the USS *Ramapo*, had been bucking stormy weather, a storm that had a fetch of thousands of miles. One night during the worst of the storm, an officer saw a great wave rising astern, its crest at a level above an iron strap on the crow's nest of the mainmast. The ship was then on an even keel, riding in a trough between waves. This made possible an exact line of sight from the bridge to the crest of the wave. Simple mathematical calculations gave the height of the wave—112 feet!

Basically, wind waves come in two kinds: sea waves and swells. Sea waves are those produced in the immediate vicinity of a storm. They are generally a confused mass, of all shapes and sizes, running into and



Reflected waves have their beginning with a rapidly moving storm squall (top) which creates the long, low, flat waves. These grow and move with the storm until they hit shore (center.) Then they reflect back to the opposite shore (bottom.) Because this wave "bounces" from one shore to another, it occurs only in enclosed bodies of water.

past one another. When the wind is brisk, it blows the tops off the steeper waves, producing whitecaps.

When the waves and the storm that produced them separate, the waves are then called swells. These swells can go on, in regular, undulating patterns, until they reach some distant shore and spill their foam upon some beach thousands of miles away from the storm. Recently, the Scripps Institute identified individual wave groups as they originated in Antarctic storms and tracked them northward across the Pacific. About two weeks later they broke on the coast of Alaska.

Some swells, if the storm that produced them was long enough and strong enough, can become quite destructive when they reach shore. Almost unnoticed at sea, they can rise to great heights when they roar into shallow waters.

That's what happened to Barbados in 1958. On a pleasant day, with no storm in sight, 30 and 40-foot waves began crashing on the shore. Later it was learned that the storm that produced them had occurred two days before near Cape Hatteras.

Tidal waves are just what their name implies—waves caused by the

tides. But the name is often given, mistakenly, to the giant killer waves known as "tsunamis." True tidal waves are normally not dangerous unless they move in the right combination with a severe storm.

Tsunamis, however, are the most destructive of all waves. Triggered by underwater earthquakes, landslides or volcanic explosions, they can move with speeds up to 500 m.p.h.

Tsunamis often unexpected

Ironically, tsunamis (pronounced soo-NAM-ees) are relatively harmless until they reach shore. Then they build up to devastating heights. Hilo, Hawaii, in 1946—again unexpectedly and on a clear day—was hit by a tsunami created by an earthquake near the Aleutians. The entire waterfront was destroyed. Some of the waves were recorded as far away as Chile, 8,000 miles to the south.

Historically, tsunamis have been blamed for some of the most tragic death tolls—30,000 in Italy in 1783, and 27,000 in Japan in 1896—and the Aleutian area has been blamed as one of the worst tsunami producers, with Hawaii and Japan its chief victims. One expert claims that an underwater trough "guides" the tsunamis produced in the Aleutians toward these two hapless areas.

The third major killer wave is known as a reflected wave and has nothing to do with the open sea, but is produced in inland bodies of

water which, because of their shapes, are susceptible, roughly, to the same effects you'd get by sloshing water in a bathtub.

One such wave took Chicago, on the shores of Lake Michigan, by surprise in 1954. A squall line, moving west to east with the right combination of air pressure and wind effect, produced a long, low wave that hit the southeastern shore. Now on its own, and with no place else to go but back in the direction it came from, the powerful wave roared back to the Chicago shore where it caused the deaths of seven fishermen.

Reflected waves are often erroneously called seiches. A seiche (pronounced saysh) has similar origins, but different results, because the water continues to rock back and forth from one shore to another. It occurs most frequently in the United States in Lake Erie which, because of its long, narrow profile, shallow depth and prevailing winds, seems to be ideally suited.

Killer waves, while still dangerous, are less so today than they were years ago when thousands of people were killed. Even Hurricane Beulah, one of the most destructive of all storms, killed only a handful of people.

Modern warning techniques and detection equipment, including weather satellites, have done much to neutralize the destructive forces of nature by allowing the evacuation of people from coastal areas where one of the killers is expected to strike.

Saturday night in space

Science Month



It will be possible for astronauts to take a shower in space, but it won't be like any shower on earth. A shower stall, designed and built by the Martin Marietta Corp., was flown in an Air Force KC-135 performing zero-gravity parabolas.

The big question is: What will water do in zero-gravity? Will it become an uncollectible mist of minute particles? Will it bounce off the astronaut without wetting his skin? Will he, indeed, be able to cleanse himself?

The tests revealed that water sprayed on the skin behaves somewhat like syrup. The test subject, strapped in the shower stall, sprayed water on himself and found that it flowed thickly—like syrup—over his body. When scraped off, the water floated about in globules and adhered to the side of the shower stall. Often, spheres of water as large as two inches in diameter would float around the shower stall as if they were soap bubbles.

Under zero gravity conditions, water for this test subject's shower floated about in globules or flowed thickly, like syrup on his skin. But cleaning was possible.

Bacteria test patches, taken before experiments and compared to patches taken in earth environment, indicate that it is possible to keep clean in space.

To collect water after a shower, the astronaut in zero gravity would retrieve it with a modified water vacuum cleaner.

LSD birth defect?

Scientists have discovered that the use of LSD causes breaks in the

chromosomes, and there has been a suspicion that this might result in birth defects in the children of users. Recently the first documented

case of a baby with birth defects after her mother had taken LSD was reported.

Dr. Hans Zellwager and associates at the University of Iowa said the baby, born in Iowa last summer, had a severely deformed right leg.

The report said that the 19-year-old mother had taken enough LSD on four occasions during pregnancy to have hallucinations.

The doctors believe that LSD

caused the defect because there was no evidence of birth defects in the families of father or mother, and the mother did not take any other drugs during pregnancy.

Frostbite dangers

"Winter sports enthusiasts often are frostbitten without realizing it,"

Gigantic eggs laid by the world's largest bird, extinct for centuries, have been brought back from Madagascar by a National Geographic Society staff member. Left, Dr. Melvin M. Payne, president of the Society, contrasts one of the fossil eggs with that of a chicken. The monster egg was laid by the elephant bird, *Aepyornis maximus*. It was the elephant bird that probably inspired Sinbad the Sailor's story of the roc. It stood nine to 10 feet tall and weighed half a ton. Not surprisingly, it couldn't fly. A reconstruction of the elephant bird is shown right. Since no remains of *aepyornis* other than bones have been found, scientists can only guess what its plumage looked like. But they note that all large flightless birds have mainly black, white, or gray feathers. The bird survived on the island of Madagascar until at least the 9th century A.D. There were huge numbers of them, but they were apparently wiped out by hunters after man came.

Photo by James E. Russell © Natl. Geo. Soc.

Painting by Walter A. Weber © Natl. Geo. Soc.



writes Dr. John Henderson in *The National Observer*.

"For years," continues Dr. Henderson, "two commonly accepted theories of frostbite treatment were rubbing snow on the frostbitten part or allowing the tissues to thaw out at room temperature. Both of these methods have been discarded. Actually rubbing the injured area with anything can be harmful because frostbitten tissues are extremely vulnerable to further injury. Thawing out injured tissues at room temperature is a long and painful process, which does little to save those tissues."

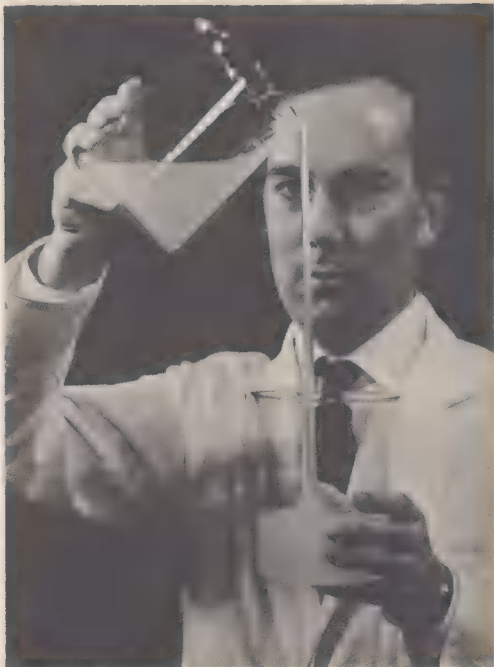
The best treatment, says the doctor, is to bring the frostbitten tissue back to normal quickly, yet gently. "The optimal effect has been obtained by immersing the affected area in warm water at a temperature of 103 to 107.5°F."

Plastic seaweed

Artificial seaweed, in the form of six-foot-long clumps of polypropylene foamed "yarn" planted on the ocean bottom near our coastline, may prove to be an economical system for stopping the erosion of beaches and shores and increasing the supply of fish.

The latest and largest experiment to date is now being carried on at Wallops Island, Va., under the direction of scientists at the NASA research station there.

The experiment involved "plant-



Water can be made to flow uphill by adding a small amount of a new chemical to it. The chemical reduces friction between the liquid and its containing wall. Dr. D. A. White of University College, London, demonstrates how the water can flow up the side of a beaker. Widest industrial application of this phenomenon is to get oil out of wells more easily.

ing" three large arrays of a polypropylene seaweed called Olefern, manufactured by the Avisun Corporation. Large angle-iron frames, concrete-weighted, with Olefern clumps attached, were placed in predetermined positions offshore. According to John S. Dartnell, project director, "Theoretically we should achieve deposition and build-up of berms or

sandbars. Actually, if we can stop the erosion and maintain the existing beach, we will consider the experiment quite successful."

Keeping up with traffic

Traffic "rabbits" to pace motorists through tunnels and similar bottlenecks have been proposed by Westinghouse researchers. They envision lights that would move along the roadside to lead drivers quickly through tunnels, somewhat like mechanical rabbits leading dogs on race tracks.

Tunnels and their approaches would be lined with rows of lamps

or fixtures spaced two or three feet apart. Each lamp would flash as a car approached, giving the driver the appearance of a single light always moving ahead of his car.

The lights would be connected to a central computer which would be aware of all hazards in a tunnel, and would know the position, velocity and acceleration of every car at every moment.

Motorists would be guided more smoothly, safely and quickly than they can drive unaided, especially in rush hours or holiday weekend traffic.

Oriental languages machine

RCA's Chinese-Japanese Korean Ideograph Composing Machine is the first electronic type-setting machine to compose those three written languages directly from a keyboard. Just delivered by R.C.A.'s Advanced Technology activity in Camden, N.J., to the U.S. Army, the machine can set 60 to 100 characters a minute from a storage bank of 10,000 characters, turning a tedious task into a fast one.



The first electronic type-setting machine to compose Chinese, Japanese and Korean written language directly from a keyboard has been developed by RCA for the U.S. Army.

The Chinese-Japanese-Korean Ideographic Composing Machine employs a technique that is the first radical departure from hand-set type in the 3,000-year history of these written languages.

By combining the latest in computer, television and optical techniques, it does away with the formidable typographical problems posed by ideographic languages with their "alphabets" of thousands of characters.

The machine can set 60 to 100 characters a minute—each character representing a word, a phrase or

a complete sentence from any of the three languages—from a storage bank of some 10,000 characters. This speed compares with the hitherto tedious task of a man painstakingly choosing the correct characters by hand from massive cases of type.

The machine is for use by the Army in type-setting training publications, orientation literature, information leaflets and other printed materials in the three Oriental languages.

The machine does not set type in the conventional way that a Linotype machine does. It is an electronic system, utilizing television techniques and an optical tunnel to reproduce the characters very rapidly on film and then transfer them to lithograph plates for offset printing.

To achieve the 10,000 characters, 21 basic strokes were chosen—horizontal, vertical, curved—and 28 complete symbols, such as circles, squares, triangles, in various combinations to make up virtually all characters in these three complex languages. These basic strokes and symbols, plus 11 punctuation marks, are represented on the machine's keyboard.

A strand of sapphire

Scientists of Tyco Industries, Inc., of Waltham, Mass., have been able to grow strands of ultra-high-strength sapphire crystal.

This sapphire, however, will never



After this mongrel dog was drowned in an experiment in Kiev, Russia, recently, a heart and lung machine brought her back to life. She was submerged for 40 minutes. Soviet scientists think this is the first time life has been restored so long after heart and breathing have stopped. Information from the test may help restore human life after periods of apparent death.

find its way into jewelry. The artificial sapphire strands will probably be extensively used in composite materials.

Composite materials are generally made up of a plastic or metal reinforced with fibers of other materials like boron, sapphire or glass. These fibers have great strength, many times that of large quantities of the material of which they are made. Imbedded in other materials, the fibers act like steel rods in reinforced concrete.

The new sapphire may also ultimately find many other uses including a lifetime razor blade. Sapphire is one of the hardest materials known and by this process could be made into a thin strip with a cutting edge that would last a lifetime.

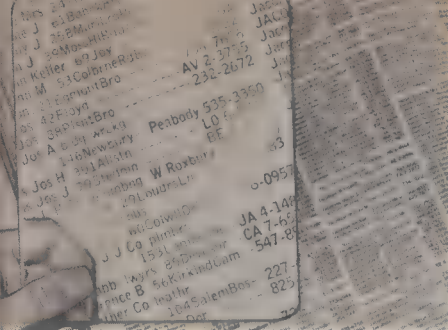
NEW FOR PEOPLE



Grow your own natural insect trap. Carnivorous plants do eat bugs. Venus Fly Trap snaps shut on prey, and Purpea Pitcher Plant attracts them with liquid in pitcher. Armstrong Associates, Box 127, Basking Ridge, N. J.

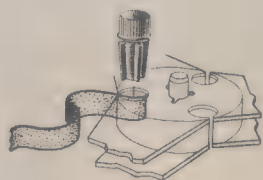
The latest in mini-things is a battery powered radio-phonograph weighing less than two pounds that uses tiny 45 r.p.m. records. Hip Pocket Records, hit tunes only, are sold separately. Philco-Ford Corporation, Tioga and C Streets, Philadelphia, Pa. 19134.





Looking up a number in the phone book or reading the classified advertisements no longer need strain the eyes. This Page Magnifier is thin and full page size, 7x10 inches, to make handling easy and fast. Stadri Products Co., 147-47 Sixth Ave., Whitestone, Long Island, N.Y. 11357.

Silent Partner is for the girl who doesn't like to drive alone, especially at night, but must sometimes. If she feels safer in the company of a man, here is a quiet companion made to order. He is both life-sized and inflatable and sits next to the female so she doesn't appear to be alone.



A device to eliminate nuisance in threading reel-to-reel tape recorders is called Tape-It-Easy. It's a non-metallic threader to keep tape from slipping out of the take-up reel once inserted in slot. Turnex Co., P.O. Box 1223, Darien, Conn. 06820.

For the newest of game-time activities, try the Ya-Ya Hoop. Hold onto the handle, give it a whirl, and the little ball in the track inside the hoop goes round and round. R. J. Steffan & Company, Dept. 200, P.O. Box 215, Angola, Ind. 46703.





Airline hostesses have the strangest duties these days—similar to zoo keepers. This ground hostess in London gets to treat a couple of baby seals, on their way to a Copenhagen zoo from Chicago, in their favorite manner—with a nice cool shower.

Jet-set animals

by Glynn Maples

THERE was this Ethiopian aardvark, see. She had a ticket to fly from Asmara, Ethiopia, to Philadelphia. Nothing unusual about that, right? But here's the zinger: There was nobody, man or beast, there to meet her in Philadelphia. So she sat around in the terminal, doing whatever stood-up aardvarks do, and she caught cold. A few days later, she died.

It wasn't that the aardvark wasn't loved. There was a foul-up somewhere between Trans World Airlines, which carried her on the last leg of the trip, and West-

ern Union. As a result the Philadelphia Zoo wasn't notified immediately when the \$1,100 animal arrived.

The case of the late aardvark illustrates how things can go wrong when aardvarks—or any other animals—travel by plane. The example is not an isolated one. More and more animals are taking to the air, and the boom is bringing headaches to the airlines, pilots, cargo handlers and insurance companies.

"If we had as much trouble with people as we do with animals, we'd be out of business," moans a cargo official at United Air Lines.

Some other examples of airline

woes in dealing with animals:

—In April of last year, TWA flew a planeload of 364 calves from New York to Salonika, Greece. The calves arrived in good shape, but the airplane had to be removed from service. "It took us 10 days to get the stink out of that plane," says a TWA executive.

—In New York recently, a big rhesus monkey broke loose in Pan American Airways' freight terminal and spent nearly three weeks swinging happily from the roof girders. During that time, the monkey would periodically "and with great accuracy" urinate on U.S. Customs officers working below, recalls a Pan Am official. After the irate Customs men threatened to walk off the job, airline employes managed to lure the monkey from his perch with bananas.

Sometimes, animals break loose in flight. Last summer, for instance, on a Swiss charter flight from Frankfurt to London, three lion cubs escaped from their cages and wandered into the cockpit. The jetliner made a hasty landing at Brussels while co-pilot Max Schomenberger fended off the lions with a fire ax. As police armed with machine guns surrounded the plane, the flight crew crawled out the cockpit windows. Local zoo keepers opened the cargo hatch and netted the lions. The only casualty: Co-pilot Schomenberger was badly scratched.

Monkeys, which are flown into the country by the thousands for drug research, also give flight crews gray hair. A KLM pilot discovered a rhesus monkey nestled in the cockpit wiring several days after a monkey lift from Amsterdam. And San Francisco airport employes claim they saw a United jet freighter taxi into the terminal with a monkey peering out a cockpit window. (United denies this, but it concedes a rhesus monkey ran amok in San Francisco and wrecked an airliner's instrument panel—while the plane was unattended.)

Industry-wide figures on the air shipment of animals aren't available. However, the Air Transport Association, a Washington-based trade group, estimates the business has easily doubled in the past five

An unlikely looking twosome, this hen and elephant are merely congenial traveling companions aboard a plane from Bangkok, Thailand, on their way to New York.

U.P.I.



Reprinted with permission from The Wall Street Journal © 1967 Dow Jones and Co.

years. United, one of the biggest in the field, says it carries an average of 140 animals a day, producing a daily revenue of \$4,218. Many of these travelers are dogs and cats, although in July—a typical month—United flew tigers, three-toed sloths, baboons, swans, goldfish and snakes, among others.

Elephant cargo costs

Richard P. Lambert, American Airlines vice president for freight, says: "Not a day goes by that we're not carrying some kind of crazy animal." Airlines base animal cargo rates on weight and then tack on a premium of up to 250 percent for special handling. One example: It costs \$838 to fly a 1,500-pound elephant from New York to San Francisco, including a \$128 fare for an attendant, who is required to go along.

Why send animals by air? "Animals just aren't good travelers, so the faster the trip the better," says Fred Ulmer, curator of the Philadelphia Zoo. "On a quick flight there's much less danger that they will be harmed by neglect."

Mr. Ulmer says he air freights about 100 animals a year—shipping them to other zoos or receiving them from animal dealers. Most arrive in good condition—in contrast to his aardvark. Insurance Co. of North America and several others shared the \$1,100 loss on the aardvark. "Until this came up, I used to think aardvarks were just something to start off dictionaries

with," says John Armstrong Jr., INA's underwriting secretary.

Losses on animal insurance are nothing new to the company. "The exotic animal business has no charm for us," gripes Mr. Armstrong. "On my desk I have a loss of \$23,000 for two gorillas that froze to death on a Northwest Airlines flight to Seattle. And here's an autopsy report on 714 pounds of parakeets that died of smothering on an airliner—that disaster cost us \$4,189." All told, the insurer lost money on animal insurance last year, though it represents a tiny portion of the big company's business.

Flying animals can lead to some sticky legal problems, too. Several years ago, United was sued for \$4,400 by an El Cerrito, Calif., dog owner who charged that the airline was negligent in allowing her prize-winning poodle, Astron Black Star, to escape at San Francisco Airport. United recaptured Astron five days later, but not before the dog, who was in heat, took up with some unsavory companions.

Poodle lawsuit

According to the lawsuit: "By reason of the indecent liberties taken by these low-bred mongrel dogs in the county of San Mateo, said Astron Black Star became impregnated. Astron suffered extreme humiliation, shock, trauma and other psychological difficulties not presently diagnosed." Furthermore, the suit continued, Astron endured "mental anguish and has generally

been rendered sick of mind and body."

United settled the case out of court for a token amount.

Currently, a race horse owner is suing United for \$500,000 in Federal District court in Denver. The owner, Gomer Evans of Tulsa, Okla., claims at the last moment United balked at flying his filly from Denver to a big horse race in Chicago. The horse thus missed the race and lost a chance at the \$140,000 first place money. More important says Mr. Evans, "I own 15 kinfolk of that horse—they would have been worth a fortune if she'd won." Mr. Evans' attorney says, "We'll argue that the filly was a surefire winner, and United will say she was a brokendown nag."

Legal problems aside, airlines consider their exotic animal passengers as prime fodder for human interest photos and press releases. United, for example, got nationwide publicity when it successfully flew two killer whales from Seattle to San Diego's Sea World.

But there's often trouble here, too. United's West Coast publicity director recalls that a prize bull posing for a photo stepped squarely on a stewardess' foot, cracking three bones (the stewardess sued). Moreover, a "tame" lion, also flying United, bit off the index finger of a free-lance photographer. And a prize candidate in the Calaveras County, Calif., frog-jumping contest disappeared — temporarily — down the bodice of a professional but squeamish model.



Albert, the three-pound octopus (above) is being examined from afar by an airline hostess. He was shipped to the New York Aquarium at Coney Island by air freight. The first thoroughbred to use jet-travel to span the nation, Kelso, (below) boards his New York plane bound for Los Angeles.



Lookalikes

MIMICS are known the world over, but there are probably none so proficient in their calling as some of those in the insect kingdom. And since these artists of impersonation use their natural gift of mimicry to protect themselves from enemies, it's interesting to note that when they imitate another creature (instead of a plant, as some do), it is usually one much more ferocious. Maybe some of it's wishful thinking, too.

Right: The swallow tail larva sees almost nothing out of its real eyes at the tip of its head, but the big false eyes on top make it look like the common green snake from a distance. The snake is quite feared by birds, a natural enemy to the larva.

Below: Obviously a butterfly and an owl, but strange that one should resemble the other so. The giant Caligo butterfly of South America is pinned upside down here, but it is marked much like the eyes of the owl. This appearance is believed to frighten birds that might devour it.



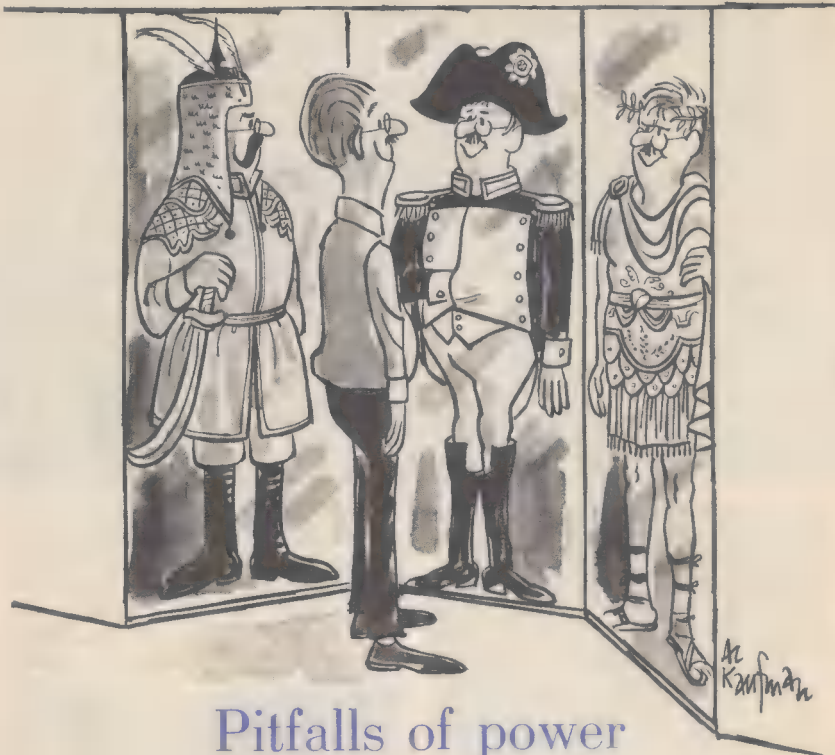


Above: This mimic (left) is the lantern fly of South America. It comes armed with two forms of natural protection. First, it has a head shaped like a baby alligator, as shown in comparison here. It also has the ability to make its head glow strangely, naturally rather disconcerting to enemies.

Below: A thorn by any other name is called a tree hopper. This little insect (there's one on each stick in the picture) looks so much like a thorn that most birds that would find it appetizing normally simply don't see it. Its six legs are hardly visible beneath its body because they're so small.

Below: Which is the real branch? Or which is the real stick caterpillar? It's hard to tell, but the stick without leaves is the caterpillar. When it rests or is frightened, this master of disguise becomes rigid and looks just like any other twig, thus fooling any would-be predators in the vicinity.





Pitfalls of power

Man's need to feel important has driven him to put demands on himself which he cannot always meet, thus pushing him deeper into insecurity.

by Flora Rheta Schreiber
and Melvin Herman

"THE fear of ridicule," a young lawyer told his psychiatrist, "has always bothered me. I've always tried to make myself important. This is probably why I've gone as far as I have."

He wanted to do a good job, not for the sake of the job itself, but

because of the acclaim it would bring him. "I feel it is my duty," he said, "to do outstanding deeds instead of just living a normal life and trying to get by in the world." He added, "I've probably gone way beyond my capabilities."

Dr. John G. Nemiah, a Harvard Medical School psychiatrist, reports of this young man that his every action had been guided by what he



TIME
LIFE
BOOKS

invites you to

**explore two billion years
of EVOLUTION**

ENJOY IT WITHOUT OBLIGATION FOR 10 DAYS ►

352

ne I
cide
keep
evol-
The
may

The marvels, miracles and mysteries of life are yours to enjoy for 10 days as a guest of



SHARK



LIZARD



OPOSSUM



LEMUR



MONKEY

Why does man seem so similar to the ape? Why do ancient rocks contain imprints of creatures now extinct? What causes giants, dwarfs, albinos? A little over a century ago, no one really knew.

Then an English biologist, Charles Darwin, published one of the most important books in history. The first 1,250 copies of his *The Origin of Species* sold out in a day, and a storm of controversy broke which has never entirely died.

Now here at last—in the style that LIFE has made famous, so that it makes perfect sense even to school children—is the remarkable story of evolution in this beautiful introductory volume of the LIFE Nature Library.

You retrace the historic voyage that young Darwin made on H.M.S. Beagle, and see the very same phenomena that set his mind ablaze. You see the primitive Indians of Tierra del Fuego, at the bottom of the world, so tough they sleep naked on icy ground. You tour the Galápagos Islands, Nature's own laboratory of evolution, where complete isolation from the rest of the world has resulted in startling species never seen anywhere else.

You see the clues to bygone life—shells, bones, tracks, eggs, imprints or entire mummies—preserved by Nature in tar, coal, ice, and stone. You see a frozen baby mammoth perfectly preserved in Arctic ice for 22,000 years. You share the thrill

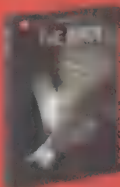
of the couple in Tanganyika as they uncover the bones of the world's earliest known man—over a million years old!

Genetic scientists take you into their laboratories to explain the mysteries of the microscopic genes and chromosomes that determine the inheritance of characteristics. You see a human egg magnified 2,000 times. How a living cell divides.

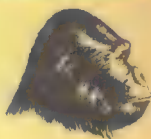
Obviously so vast and exciting a book cannot be adequately described here. So we invite you to *borrow* a copy from us for 10 days. Then if you wish you may return it and owe nothing. Or you may own it for much less than such an expensively printed and handsomely bound book would ordinarily cost. Thanks to TIME-LIFE's vast facilities and large print orders, you pay only \$3.95 (plus shipping and handling). Then you will be entitled to receive another volume of the LIFE Nature Library for free examination every two months.

But you make no commitments, promise to buy nothing. And you may cancel this arrangement any time you wish. However the entire series makes an impressive encyclopedia of Nature that your family will increasingly treasure—a superb reference shelf and study aid used in thousands of classrooms from elementary school through college. To examine the first volume without obligation, simply mail the postpaid reply reservation form.

Some of the other volumes in the **LIFE** Nature Library



ies of evolution...
the **LIFE** Nature Library

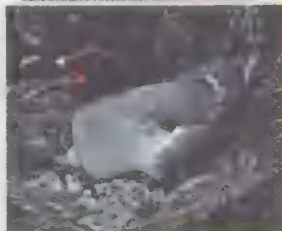
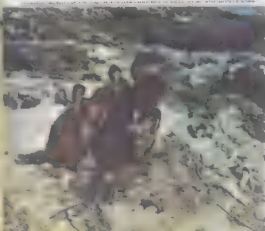
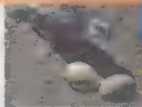


GORILLA

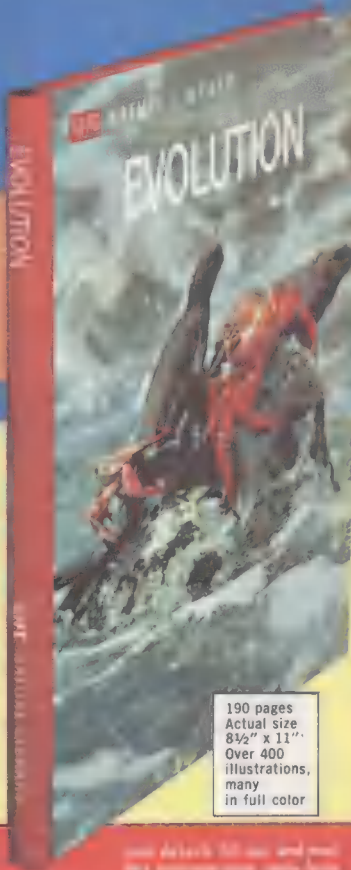


MAN

The 2 billion year evolution of man can now be traced from fossil remains of past species.



THE STRANGE RESULTS OF SECLUSION. On the isolated Galápagos Islands, Darwin was amazed to find birds unlike any others in the world. These odd new birds led him to question the "stability of species."



190 pages
Actual size
8½" x 11"
Over 400
illustrations,
many
in full color

SEND NO MONEY

TIME
LIFE
BOOKS

0352

Please enroll me as a subscriber to the LIFE NATURE LIBRARY and send me Volume I (EVOLUTION) for a 10-day Trial Examination. If, at the end of that time, I decide not to continue the series, I will return the book, canceling my subscription. If I keep the book, I will pay \$3.95 (plus shipping and handling). I understand that future volumes will be issued on approval at two-month intervals, at the same price of \$3.95. The 10-day Free Examination privilege applies to all volumes in the LIBRARY, and I may cancel my subscription at any time.

NAME _____

ADDRESS

CITY

Residents of Canada: Mail Form in envelope.

Schools and Libraries: Order from Silver Burdett Co., Morristown, N. J. 07960.

Library-styled bindings. Eligible for Titles I, II funds.

Do you know amazing facts like these?

There is a bird that uses a tool—a long cactus spine—to extract insects from holes in trees.

Over a million different animal species and a quarter of a million different kinds of plants inhabit the earth today.

A scientist has manufactured rabbit blood hemoglobin in a test tube.

The earliest Man is believed to have existed over one million years ago.

"Adolescent" baboons develop close friendships which sometimes last for years.

One out of every 20,000 human beings born is an albino.



Giant tortoises of the Galápagos Islands often have shells as large as bathtubs. Full grown, they weigh up to 500 pounds.



The colorful frigate bird is a pirate who snatches his food from other birds.



South African "stone plants" grow in stonelike shape and color except for once-a-year blooms.



Gorillas have close family ties much like humans. This mother gorilla is shown toying with her newborn baby.

**The wonders of EVOLUTION are yours to enjoy
for 10 days as a guest of the **LIFE** Nature Library**

More than 1,500,000 families have already ordered volumes from the Life Nature Library.

FIRST CLASS

Permit No. 22

Chicago, Ill.

BUSINESS REPLY MAIL

No Postage Stamp Necessary if Mailed in United States

POSTAGE WILL BE PAID BY

TIME-LIFE BOOKS
Time & Life Building
Chicago, Illinois 60611



thought would please others and make them like him. Even as a young boy he attempted more than he could handle, just to show off to his parents and peers. On one occasion, for instance, he took a watch apart, to compete with other boys more mechanical than he who had done so. He memorized every part of the watch and put it back together neatly. However he made a mistake; the hands ran backwards. Years later he still dwelt on this failure. It was part of his lifelong feeling of insecurity.

Sick but "important"

Rising swiftly in his law firm and in the political life of his community, he was "important." At the same time he was a sick man. The price of his success was an anxiety so acute and a depression so formidable that he ended in a mental hospital.

"Long before Freud," Yale Professor Harold D. Lasswell reminds us, "it was common to describe the psychopathology of kings, generals, judges and other public figures."

"We are divided in our thinking about our leaders. We make heroes of them. At the same time, we set them apart as less virtuous than ourselves. We think of them as corrupt or at least corruptible. We agree with Lord Acton's famous statement, 'Power corrupts, and absolute power corrupts absolutely.'"

One source of the power drive is narcissism. Narcissus, of the ancient Greek legend, was a young man of

great beauty who, in that mirrorless time, first saw his reflection in a pool. He was so struck by his own beauty that he fell madly in love with it. Unable to possess what he most deeply desired—himself—he destroyed what he couldn't have by committing suicide.

Narcissism is no longer seen only as manifested by the destructive self-love of the original legend. It is seen as feeding on the high regard of other people, an extension in adulthood of the intense narcissism of early childhood, during which our fortunes rise and fall in terms of parental approval or disapproval. As Dr. Nemiah puts it, "Love, attention and admiration from others are narcissistic supplies essential for self-esteem." In the power-hungry, these supplies are, again in Dr. Nemiah's word, "insatiable."

This narcissistic psychopathology often results in developing goals far beyond one's capacities. When these goals remain unrealized, the individual suffers from a sense of inadequacy. To realize them, however, he becomes prisoner of his own aspirations.

Even the highly endowed, whose race for power is based on real capacities, walk the narcissistic treadmill. To fulfill themselves, they must be self-absorbed, ruthless, manipulative. They must also face the loneliness and isolation of being outside the crowd at the same time

Miss Schreiber is an award-winning writer on psychiatry; Melvin Herman, the Executive-Secretary of the National Association of Private Psychiatric Hospitals.

that they must use the crowd for their own fulfillment.

Philosophers have long battled about the irrational force of will. Schopenhauer regarded a man's will as the basic fact of existence—a will as ruthless as it was irrational. He saw the world as governed not by textbook rationality but by unenlightened irrationality. At the same time he dreamed of a Buddhist-like state, above striving and passion, that would make it possible for man to free himself from the irrational forces of will.

Nietzsche agreed with Schopenhauer but used his arguments to reach different conclusions. Nietzsche said man should not renounce his irrational strivings, but should cultivate the irrationality inherent in "the will to power as the ultimate aim of life."

"Supermen" advocated

With this concept as the pivot of his thinking, Nietzsche advocated the development of a race of supermen who would realize all of man's potential by rejecting the restricting influence of Christian morality. This view anticipated psychiatric understanding by taking into account the all-powerful influence of the irrational unconscious forces of the mind.

The Nietzschean supermen were openly to strive for independence which he equated with power itself. He wrote that, "Independence is for the very few; it is a privilege of the strong. And whoever attempts

it, even with the best right but without inner constraint, proves that he is probably not only strong but also daring to the point of recklessness. He enters a labyrinth, he multiplies a thousandfold the dangers which life brings with it in any case, not the least of which is that no one can see how and where he loses his way, becomes lonely and is torn piecemeal by some Minotaur of conscience. Supposing one like that comes to grief. This happens so far from the comprehension of men that they neither feel it nor sympathize. And he cannot go back any longer. Nor can he go back to the pity of men."

To seek power, according to Nietzsche, is to realize the best in the self. This realization in turn assumes a number of different guises. Type one wants to possess a whole nation of people, and to do so, practices the dark arts of politics. Type two has the same ambition but, unwilling to hide behind a mask, reveals himself and says, "I must let myself be known." Nietzsche, while describing Cesare Borgia, the ruthless Renaissance leader, as a beast of prey, refused to regard him as pathological. To this philosopher, the Borgias of the world are healthy and valuable people. What is pathological is the reaction to them, which he regarded as a false morality of timidity.

According to Nietzsche, we further reveal our pathology by the way we react to the criminal. "There is a point," the philosopher says, "in the history of society when it

A confused set of values allows the world to condone falsity for the sake of wealth and power.

becomes so pathologically soft and tender that it sides even with those who harm it—criminals.”

At the time of the mammoth T.V. quiz show scandal, Prof. Hans Morgenthau of the University of Chicago, said, “Contemporary America offers temptations of wealth and power held out by government and business. . . . The world condones the betrayal of truth for the sake of wealth and power.”

What lies behind public acquiescence to deception is that American society cannot condemn the evil doer without condemning itself, which, of course, it cannot bring itself to do. Here, then, we have mass psychopathology, a general confusion of values whereby, as Prof. Morgenthau puts it, “a whole society tends to absolve the wrongdoer by confusing the virtues of compassion and charity for the actor with the vice of condoning the act.”

We go along with those who engage in a catch-as-catch-can fight for power, according to sociologist Alfred McClung Lee of Brooklyn College. We accept a false front of proper behavior as being practiced in our society, although it really isn't. We swallow the deceptions given to us for good public relations. We know it is all a game, and we rarely question it. Even the most idealistic among us plays according to the rules.

Lee notes that even the research physicist or lawyer who is devoted idealistically to his profession may piously pontificate to himself or his wife about what he “has to do” as part of his daily work. At the same time, however, he will usually conform or at least compromise with “how the boys operate” if he is to “get ahead.” An inexperienced school superintendent may do his moral duty by preferring charges of incompetence against an inadequate teacher, Lee points out in the book, *Multi-Valent Man*, and then is astounded to find that he—rather than the teacher—is in effect the one placed on trial. He soon discovers that he cannot buck the powers that be.

Where does the power lie? Sociologist C. Wright Mills says the individual has power only insofar as he represents a group. Take the group support away from the man, and he is nothing. Such an elite, he adds, may be considered omnipotent and its powers regarded as a great hidden design. In Mills' definition, one is in power if he is in a position to realize his will even if others resist it.

Ernest Dichter, president and founder of the Institute for Motivational Research, speaks of the strategy of human desire, which he regards as the most important weapon in the arsenal of power.

Dichter points out that there is

no one reason why a man becomes a lawyer, a psychologist or a businessman, and, in fact, no rational reason at all. Rationality, he reminds us, is a fetish of the 20th century; our culture does not allow us to admit true irrationality as an explanation of our behavior. Yet, says Dichter, "The majority of religious and political systems, as well as such aspects of human behavior as loyalty, love and affection, are all irrational."

The powerful have a mutual attraction for each other. They not only tend to marry each other, but are also aware of themselves as a social class. They behave differently towards each other than they do towards other classes.

Part of an elite—called the power elite by C. Wright Mills—these men

and women occupy positions which enable them to transcend the environments of ordinary persons. They and their advisors, consultants and opinion-makers are in a position to make decisions of major consequence while the rest of struggling mankind, though living in a time of big decisions, is driven by forces he can neither understand nor govern. In the daily existence of job, family and community, he lives outside the mainstream of decision-making.

Power struggles go on even in the environment of the family. For instance, a man in his 40s, whom Dr. Nemiah saw as a patient, was obviously anxious and upset. He sighed often. His face looked troubled. Nevertheless, he not only denied that something was bothering him, but actually insisted, "I'm not depressed or anxious. I have no worries at home. My finances are sound." The more he talked, the more unbelievable became his assertions. He had been out of work for a year because of a back injury, but insisted that never in his life had he been frightened or felt sad. His life, he protested, was completely serene and happy. The chink in the armor of his fancied Utopia became clear, however, when just once in the hour-long interview he said of his wife, "She and I get along just fine. She does what she wants to do and I do what I'm told to do."

The struggle is just as intense when it is not to rule the world but only the roost.



"Hello, Chief? I think I've discovered the source of those mysterious fires."

Synthetics to 'build' a man

by Arthur J. Snider

ALL through life, beginning with travel through the birth canal, the nose is mashed, bumped, squeezed, twisted and broken. Prominent and protuberant, it is a prime target for abuse.

Thus it isn't surprising that surgery of the nose is one of the oldest forms of plastic reconstruction. Restoration of noses was described in Egyptian papyruses as early as 3000 B.C. Ancient Hindu surgeons reconstructed noses with skin taken from the patient's thigh.

In this age of high speed travel, sports mayhem and pampered profiles, the nose continues to be the plastic surgeon's paradise. But the nose is not alone. Today most organs of the body can be refurbished with spare part surgery.

The field has broken open only in the last 20 years. Before then surgeons unsuccessfully tried varieties of materials. Most caused foreign body reaction. The body cast them off. Some metals and plastics caused little reaction but they were hard and unyielding. They could be used only where motion was minimal, and they had to be anchored to a leg bone or screwed in as a skull plate.

Then came synthetic materials such as Dacron and Teflon, which the housewife knows as the non-stick coating for cookware. The

first spare parts were replacements for major arteries that had become obstructed through clots. Today thousands are living with grafts of knit tubing of Dacron. Thousands of others have artificial heart valves made partly of Teflon.

With the advent of silicones came further extension and improvement of surgical renovation.

The end is not in sight. At a recent meeting of the American Chemical Society, an interesting



new material suitable for spare part surgery was introduced. Like silicone, it is completely synthetic and even less reaction-provoking. Its ability to live with tissue may make it an ideal replacement for eye corneas. It has produced no reaction and has remained transparent in rabbit eyes for up to four months.

Dr. Harris J. Bixler of Cambridge, Mass., said the synthetic, called Ioplex, also is being considered for use as a contact lens. Con-

ceivably it would provide a semi-permanent contact lens, stimulating no eye-watering and requiring removal only three or four times a year.

Ioplex will continue in the animal testing stage for another year. Its first human application probably will be as a substitute for small blood vessels.

"This area of surgery remains a problem," he explained. "Limbs are lost because of clots or because the vessels are hard to suture. Ioplex, in addition to serving as material for artificial vessels can, in another form, serve as a 'glue' to join vessels."

Until Ioplex proves itself in the clinic, silicones will continue largely to stock the spare parts warehouse. A catalog would include:

Synthetic trachea, the windpipe

through which air passes to and from the lungs.

Synthetic arteries to replace long segments of the aorta, the body's main blood channel, as well as leg and arm arteries.

Silicone tubes to drain water from the brain in children with hydrocephalus.

Silicone rubber for the repair of blindness due to detached retina.

Stainless steel, chrome-cobalt alloys, Teflon, methylmethacrylate and silicone to build up various bones of the skull, including the jaw, and the soft tissues of the face, such as cheeks, chin, ears and noses.

Silicone rubber in the form of foam and solid blocks to augment the breast and replace testicles.

Chrome-cobalt and stainless steel hip joints.

Thin sheets of silicone to patch up ear drum perforations.

Soldier saves his blood

A young soldier in the Chelsea Naval Hospital, Chelsea, Mass., is giving up his own blood as often as he can so it can be preserved, should he need it one day in a transfusion.

He has a blood type so rare that a transfusion with any blood but his own could be fatal. Conversely, a transfusion of his blood into anyone could be equally dangerous.

His blood type was discovered during basic training at Fort Dix, N.J., when a call went out for blood

donations for the Red Cross. He traded a pint for a weekend pass. The donated blood wound up at Temple University Hospital's blood bank in Philadelphia where its rarity was discovered. Dr. Lyndall Molthan, blood bank director, identified it as a type of Bombay blood, which is unusual in itself. This particular blood was even more uncommon, an A-h type, found only in one other person, a Czechoslovakian nurse, in 1961.

Pursuing the rarity further, Dr. Molthan drew blood from the soldier's family. A 14-year-old sister

also was identified as A-h. She will have to wait until she's 18 before starting to bank blood in her own behalf, but the 20-year-old soldier has already begun stockpiling for himself in case of an emergency.

He cannot donate for her because he is Rh positive and she is Rh negative.

Factors to age man's heart

On the average, a person can be regarded as 15 years older than his chronological age from the point of view of coronary heart disease risk if (1) he smokes more than a



pack of cigarettes a day or (2) his blood cholesterol level is elevated markedly or (3) his blood pressure greatly exceeds normal.

A group of scientists at the National Heart Institute made the deductions on the basis of a 12-year study of factors affecting heart risk among 5,127 adults.

Risk increases for cigarettes, cho-

lesterol level and blood pressure are most striking in the 30 to 39 age group. These factors could put a man of 40 in the same risk category as a man 15 years or more older who had none of these factors working against him. The three factors also increased the coronary heart disease risk for women but not to the extent of men.

"A man can do little about his chronological age, but something can be done about these other factors that, insofar as his risk of a heart attack is concerned, make him old beyond his years," says Dr. William Kannel of the National Heart Institute. "With a physician's help, elevated blood pressure and cholesterol levels can be reduced. Even without a physician's help a man who smokes cigarettes can substantially reduce his risk just by kicking the habit."

"Bad risk" patients suffer

The passion of some good surgeons for good batting averages is causing them to bypass the less-than-ideal patient who could still benefit from corneal transplants, in the opinion of Dr. Morris Kaplan of Denver. "A surgeon selecting his cases only with a view of maximum results can achieve nearly 100 percent of good results with ideal vision and supremely happy patients," he says. "However, if he operates on all who deserve the chance for improvement, then his ideal results

drop down to something like 50 percent.

"Furthermore, if he were to operate on all the eyes that come to him begging for surgical miracles, his ideal results would drop to 10 or 20 percent.

"Probably in no other branch of surgery can the percentage of good results be planned ahead of time through patient selection as in keratoplasty (corneal transplants)."

Dr. Kaplan believes the concept of "good results" in transplant surgery should be broadened to include those who are helped only minimally.

"A 20/400 vision may not seem like much to those of us who are normally sighted or to the ophthalmologist who is eager for the magic of 20/20 in his surgery results," he says. "But it can be a thousand-fold improvement to a person who could not feed himself or tell where the doors and windows were, but who now had light projection and could discern somebody else was in the room. To him, such surgery would constitute a tremendous success."

A return to midwifery?

A Harvard professor of medicine says nurse-midwives could take over most of the child deliveries in the United States and free scarce physicians for other duties.

The system operates in Sweden, where the infant mortality rate is

far lower than in this country, says Dr. David D. Rutstein. In Sweden, the trained midwife follows the patient through pregnancy, reports untoward events to the physician and enables him to follow the patient more closely than the unaided doctor in the United States.

"At term, if the pregnancy has not been normal, the nurse-midwife, working under supervision of the physician, is in attendance with the patient from the moment she arrives in labor until after she is delivered," Dr. Rutstein points out.

"In contrast, when one walks into the labor room of an American hospital, one finds the inexperienced husband rather than the trained midwife holding the hand of the patient."

Because of the midwife's ability to perform normal delivery, it is unnecessary to schedule these in Sweden as some busy American physicians are forced to do. "As a result," Dr. Rutstein says, "in normal deliveries in Sweden, membranes are rarely ruptured, drugs to induce labor are infrequently prescribed, instruments are less commonly used and there are fewer surgical interventions."

In a new book, "The Coming Revolution in Medicine," published by the MIT Press, Dr. Rutstein says that in view of an unsatisfactory infant mortality rate in this country, it is necessary to study Sweden's system and those in all other Western countries where the nurse-midwifery system operates. Each of these countries has a lower

infant mortality rate than the U.S.

Only two states, Kentucky and New Mexico, and the City of New York, have license laws that permit practice of nurse-midwifery under medical supervision.

Military experience has demonstrated that specially trained non-medical personnel can take over many of the tasks performed by physicians and nurses, Dr. Rutstein notes. These include specifically defined physical examinations, treatment of minor illnesses and injuries, application of casts and trac-

tion following fractures, collection of blood for transfusion or analysis, intravenous treatment with blood and blood derivatives, administration of drug treatments and immunizing procedures.

In 1959, the United States stood 11th among the advanced countries of the world in infant death rate. With our lagging performance from 1959 to 1965, the author says, seven other countries, including France, Japan, Belgium and Canada, have passed us. We are now 18th from the top of the list.

AMA's facts and fantasies about health

For every disease that is known, there must be at least two dozen "home-grown, guaranteed to cure" remedies. And so there are countless superstitions regarding the right way to good health. "Today's Health Guide," the American Medical Association's health information manual, has separated fact from fantasy on a few of these medical misconceptions.

- There is *no* medicine which can be taken by mouth to dissolve gallstones.
- Heart disease is *not* necessarily a reason for refusing an operation or being afraid of anesthetics.
- Flowers do absorb some oxygen, but the main reason they're removed from a sick room at night is because they last longer in fresh air.

- Insulin does *not* cure diabetes; it substitutes for the insulin the body is unable to provide for itself.
- Premature baldness in men is *not* caused by wearing hats; nobody knows what causes it.
- Cancer has *not* been shown to be contagious.
- It is *not* important to lie on the right side when sleeping to keep from interfering with the heart's functioning, because the heart is actually in the middle of the chest and not on the left side.
- Strenuous exercise need not be avoided by persons over 40 if they have been used to it and are in good condition.
- Removing a mole will not cause cancer. Cancer is more likely to result from not having the mole removed if it should be.

Cancer producers on file

In a cancer-fighting first, an "inventory" of tumor-producing chemicals in the environment is being mapped by an international committee of scientists. The goal is to determine not only all the compounds present, but their quantities as well.

Such an inventory would enable scientists to establish a background base line for cancer-producers, just as they have established a background for radiation. Scientists know the type and quantity of all radiation impinging on the environment (such as cosmic rays, X rays and radiation from building materials), and thus can determine immediately the names and numbers of new sources of radiation, such as an atomic explosion.

"We are trying to establish if there is an irreducible minimum of carcinogens in the environment," says Dr. William Lijinsky of the Chicago Medical School. "We are not going to be able to get rid of all of it, just as we are unable to get rid of all radiation. But we will be able to tell for the first time whether a new source of contamination is contributing a significant amount of carcinogenic compounds, or whether it is only an insignificant amount, say a millionth of the amount already existing."

With a background index available, the argument of cigarette manufacturers that air pollution is much more hazardous than smoking could be evaluated scientifically.

There will be more supporting evidence to put economic pressure on violators when it can be demonstrated that a practice is adding to the background carcinogenic make-up, says Dr. Philippe Shubik, chairman of the epidemiology committee of the International Cancer Union.

The big banana hoax

Banana-peel smoking to get a "psychedelic experience" has been exposed as a hoax. A chemical analysis of the dried scrapings from the inner portion of banana peels shows nothing but inert carboniferous (containing carbon) material.

Subsequent interviews with banana smokers reveal hippies fabricated the story to "bait authorities."

Drs. Louis Bozzetti Jr., Stephen Goldsmith and J. Thomas Ungerleider of the University of California at Los Angeles made the analysis after press reports of a marked increase in the popularity of taking "trips" on bananadine, or "mellow yellow," obtained by baking the inside of banana peels. It was readily prepared in the kitchen or purchased for 20 cents a cigarette.

"There are no known hallucinogens in bananadine," the California specialists report. "Specific tests for arsenic, serotonin, ergot-like compounds and adrenergic compounds were all negative at the level of one part per million."

Nevertheless, many individuals have reported getting "high" on mellow yellow, including experiencing hallucinations. Several users told the scientists they had incurred nausea, sore throat, dizziness or coughing during and after smoking, even though no adverse side effects should result from the material.

The investigators observed that bananadine often was smoked in a group and accompanied by psychedelic lighting.

"This would suggest," they said, "the active ingredient in bananadine is the setting."

A team of New York University scientists, interviewing 50 subjects on the clinical effects of banana smoking, also concluded the effects are psychological rather than pharmacological.

Shifty-eyed Abe

The notion that you shouldn't trust anyone who doesn't look you straight in the eye is cockeyed.

"In some cases there may well be some validity to the folk tale," Dr. Edgar L. Lipson of New York says, "but in the vast majority of cases, it is not a character trait of fundamental dishonesty."

The country's great Civil War president, known for his veracity and sincerity, had a form of strabismus (squint), Dr. Lipson points out, adding, "Yet he was known as 'Honest Abe.'"

President Lincoln had a condi-

tion called hypertropia in which there was faulty alignment of one eye. Its visual axis deviated upward.

On the other hand, novelist Theodore Dreiser, who was "notorious as a plagiarist and known for his unreliability," also was afflicted with a deviate eye problem.

His was known as walleye, a condition in which one eye turns outward while the other fixes on the target. (If the eye turns in, it is called cross-eye.)

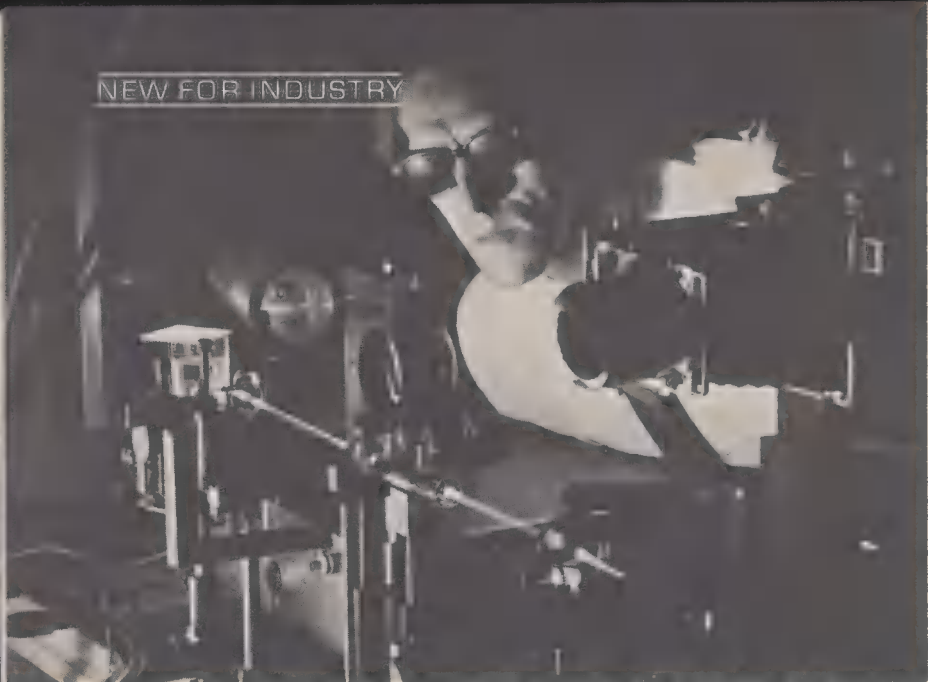
Nevertheless, says Dr. Lipson, a staff member of the New York Psychoanalytic Institute, the majority of visually defective patients he has treated are honest.

"If they had a tendency to lie, I must say it was more a tendency to bolster a shaky self-esteem during periods of fatigue or stress rather than a character trait of fundamental dishonesty."

Strabismus, which includes squint, walleye, cross-eye and other forms of muscular imbalance, is not caused by psychological trauma, even though eye specialists commonly report a high correlation between it and neurotic traits, Dr. Lipson points out. But it does have an impact on an individual's emotional makeup. It makes him feel "different, self-absorbed, embarrassed."

Strabismus is correctable in childhood by one of several treatments, but Lipson deplors the fact that eye specialists often call on the mother to make the decision as to which it shall be.

NEW FOR INDUSTRY



Above: Laboratory apparatus is used by Bell Telephone Laboratories, Murray Hill, N.J., to measure picosecond laser pulses. Pulses travel from KDP crystal (right) through ■ bromobenzene solution (center) and into cell containing ■ fluorescing medium (left). Camera records pulse and photograph is used to measure length.



Above left: Computer disk packs rolling off the line at IBM's plant in San Jose, Calif., can store more than 29 million characters of information. They offer computer users flexible and easily accessible storage. Since introduction five years ago, storage costs have been reduced eight times; accessibility is three times faster.



Left: A compact fuel cell power supply for underwater exploring has been designed by Union Carbide Corp.'s Electronic Division, P.O. Box 6116, Cleveland, Ohio 44101. Supplying electric power for heat and light, the unit can operate at ocean depths of 850 feet. The underwater system has energy storage of 28,300 watt-hours.



Electronic character reader processes 600-900 airline tickets per minute at United Air Lines in Chicago. Sorting bins are for processed tickets. Tickets pass in front of electronic retina, inside shielded hood, where numbers are read and information is transferred to magnetic tape. From Recognition Equipment, Inc., Dallas, Tex.

Electronic security system, resembling fence of horizontal metal pipes inserted through vertical wooden posts, alarms when human disturbs electro-magnetic field created by electrical currents within pipes. Called a balanced transmission line, system is by Sylvania Electric Products, Inc., 730 Third Avenue, New York, N.Y.



Only one cameraman's needed to operate this color broadcast camera developed for the American Broadcasting System by Ampex Corp., 401 Broadway, Redwood City, Calif. 94063. Model BC-100 hand-held camera and backpack weigh about 35 pounds. Color signals transmitted by microwave to background dish or by cable.

The first non-metallic, load-bearing bullet-proof armor seat for helicopters has been developed by Norton Co., Worcester, Mass. 01606. NOROC armor (made of second hardest man-made material—boron carbide) seat weighs 42 pounds and can sustain loads of 5,000 pounds. Before, seats were clad in armor, thus heavier.





Twins — what are the chances?

by Kenneth Anderson

WHAT ARE the chances that a mother will have twins? About one of every 90 pregnancies ends with the birth of two children. And triplets occur at a frequency of one in 90 times 90, or 8,100, pregnancies. Before the use of drugs made it easier for an average woman to become the mother of quadruplets, the birth of four children at one time occurred once in 90 times 90 times 90, or 729,000, pregnancies.

It's a safe bet, too, that the multiple births occur because more than one ovum, or egg cell, is released at one time and fertilized. The odds are three to one that twins will be fraternal rather than identical. Fraternal twins, although born at the same time, are related to each other in the same way that ordinary brothers and sisters are related. They have the same mother

and the same father, but they develop from separate egg cells that have been fertilized by different sperm cells.

Identical twins, on the other hand, develop from a single ovum that has been fertilized by one sperm cell. Because they have exactly the same genetic makeup, any differences that appear in identical twins are the result of influences upon the embryo before birth or after delivery of the child. For example, one of a pair of identical twins might be altered in appearance because of disease. But, in general, identical twins look so much like each other that even members of the same family sometimes cannot tell them apart. And identical twins always are of the same sex.

When fraternal twins are born, they may be of the same sex. Or one may be a boy and the other a girl. The egg cells from which they



U.P.I.

This may look like ■ plot to confuse, and it is. These three sets of twins offer visible proof of the reason confusion often arises when identical twins are around, because they are identical—unless they make their own changes, like the hairdos on the twins at left.

develop may be released at about the same time from the same ovary or, more likely, from both ovaries at approximately the same time.

The tendency to produce fraternal twins is believed to be inherited and varies according to the ethnic background of the mother. Negro parents are most likely to have multiple births and couples of Oriental extraction are least likely to have more than one child at a single delivery. Also, the Negro mother is more likely to give birth to triplets and quadruplets. One study indicates that a Negro woman has a 25 percent greater chance than a Caucasian mother of giving birth to twins and a 400 percent greater chance of delivering quadruplets.

According to some doctors, the racial differences in the frequency of twins applies only to two-ovum twins: the chances of identical twins are about the same for Negro, Caucasian or Oriental mothers. Others

contend that the age of the mother influences twinning and that identical twins are more likely to be born to young mothers while fraternal twins occur more frequently among older women.

The doctor has a number of ways of determining whether the twins are identical or fraternal. Identical twins share a single placenta. Fraternal twins have separate placentas, although they may be fused together so as to appear to be a single placenta.

Identical twins are separated in the womb, or uterus, by a thin wall made of their individual amniotic sacs. Fraternal twins have separate amniotic sacs, also; but in addition, are separated in the uterus by three other layers of membrane. They are the two chorions and a thick layer called the decidua.

Condensed from the manuscript of a forthcoming volume entitled *The Wife's Book*, by Kenneth Anderson. To be published in 1968 by Hawthorn Books, N.Y.



U.P.I.

An X ray picture shows the way in which a pair of Siamese twins is joined at birth. These twins are attached at the heart and they may possibly have a common liver.

Sometimes a microscopic study of the membranes is needed to determine whether the twins are identical or fraternal. But in many cases, even the most precise testing over a period of many years may fail to answer for certain the question of whether a pair of twins developed from one or two egg cells.

Even more complicated is the problem of determining whether triplets or quadruplets developed from one, two, three or four ova. Multiple births from a single ovum apparently occur during a delay in implantation of the zygote in the lining of the uterus. The single egg cell may divide into two or more zygotes before implantation.

There is no such thing as a single zygote dividing into three egg

cells. The division always is in multiples of two. Thus, triplets may occur from the release and fertilization of three separate ova; from the release and fertilization of two ova, one of which divides into two; or from the double division of one egg cell into four zygotes, one of which dies leaving three embryos to develop.

The famed Dionne quintuplets are believed to have resulted from the triple division of a single egg cell so that six zygotes were present at the same time. But one of the zygotes failed to develop and only five girls were born. There have been about 75 cases of quintuplets in recent years, but few in which all the children survived. Sextuplets and septuplets have been born, but in none of the cases has the entire set of six or seven children survived beyond a short period of time.

Full development of twins, triplets and so on, is more likely to occur if the twinning, or dividing, of the zygote takes place shortly after fertilization. If there is twinning after the first week, the mother is more likely to give birth to Siamese twins or incomplete twins. Incomplete twins may have one body and the arms of two babies, or some other multiple combination of body parts. Siamese twins appear to develop from a single ovum and frequently develop not as true duplicates but rather as mirror images of each other.

Despite the mirror image trend among Siamese twins, careful studies show that incomplete twins may

have greater differences in physical and psychological traits than ordinary twins that develop from a single egg cell. The Blazek twins, Rosa and Josepha, were joined at the hips, but Rosa was taller and thinner than her sister. Josepha reportedly had incompletely developed sex organs, but her sister had been able to bear a son. In the case of the male Godina twins, Simplicio was larger than his brother Lucio. The "original" Siamese twins, Chang and Eng, not only had dissimilar features, but different temperaments. Records of the twins, who died in 1874, indicate that Chang was fond of alcoholic beverages while Eng was a teetotaler. Chang and Eng in later life married sisters, operated a farm in North Carolina, and fathered 20 children.

Although conjoined twins of previous generations were destined to a life of touring the world as freaks, Siamese twins born today frequently can be separated by careful surgery. Larry and Gary McDowell of Livermore, Calif., for example, were born as Siamese twins in 1957, but were separated by surgery 17 days after birth and developed as normal boys. Sheila and Lisa Mantonya were born on Christmas Day, 1965, in Los Angeles, Calif., with a common bladder and intestinal tracts joined. But surgeons separated the twins six hours after they were delivered by cesarean section, and they were given intensive treatment, including oxygen and intravenous feeding, to insure their survival.

Much of the psychological similarity between twins is attributed to their common environment. They start life together, usually are dressed alike, and quite likely are in the same classroom when they attend school. In most cases, researchers have found, their intelligence quotients are within five points of each other, and often they are only one or two points apart. If one of the twins is mentally deficient, the chances are better than 90 percent that the other also will be mentally deficient—if they are identical twins. If they are fraternal twins, there is only a 47 percent similarity in mental deficiency. Their emotions probably are similar and their handwriting may be almost identical.

Environment effects

A University of Chicago study of identical twins separated at infancy and placed in different homes was inconclusive because the twins generally grew up in similar environments. Two sisters included in the study, however, did show some effects of a different environment. One was placed in a good home, had four years of college and scored 116 on an I.Q. test. Her sister, who grew up in a poor home, had only two years of high school and achieved a score of only 92 on the same test. A pair of identical twin boys raised in different environments also showed a variation in I.Q. when tested later in life. One, who was brought up in a Tennessee

mountain community, tested 77 on the I.Q. scale, was a moonshiner and considered lazy. His brother, who grew up in town, had an I.Q. of 96, and was regarded as a good workman.

The research suggests that large inequalities in home life and background can result in great differences in intelligence and behavior, while similar environments make identical twins appear more alike in those traits. And temperaments do seem to remain similar in identical twins, even when they are raised in different environments.

Speech habits slow

Twins appear to develop good speech habits later in life than non-twins. Some researchers claim this is because each of the twins gets only half of his mother's attention. Another reason given is that twins are more likely to lag in speech development because they tend to imitate each other and perpetuate a form of baby talk. By the time they are ready for school, twins may be as much as two years behind normal children in their use of the spoken word. However, they catch up with their classmates quickly after they begin school.

For some reason, twins are more likely to be left-handed. Again, this may be the result of environment. They spend so much of their early life eating, sleeping, playing and bathing together that it is difficult to determine the cause of the similarity. Observers report that it is

not unusual for twins to open their mouths and say the same words at the same time. And there is at least one scientific document recording the habit of one child beginning a conversation with its reflection in a mirror in the mistaken belief that it was the twin brother or sister on the other side of the glass.

About one in four pairs of identical twins are literally mirror images of each other. One twin's hair may spiral clockwise and the other's counterclockwise. Dental irregularities may appear on opposite sides of the mouth. And even freckle patterns may be reversed. The body organs also may be reversed, with the appendix of one twin on the right side and the brother's or sister's appendix on the left. So it would not be unexpected that one of a pair of mirror-image twins would feel a kinship with his own reflection.

Because they develop from the same zygote, identical twins have the same set of chromosomes in their cells, and their blood types are identical, even to subtypes and the Rh factor. This relationship of the cells of two brothers or two sisters from the same zygote permits the body of one twin to accept the tissues of the other. Although transplanting organs from one person to another is a fairly new procedure, doctors have been making skin grafts between identical twins for 50 years.

The body ordinarily rejects tissues from other human beings, even close relatives. The effect is like

Although a rare occurrence, twins have been known to be born as much as a month apart.

that of an allergy, such as hay fever, in which presence of a foreign protein triggers a hostile reaction by the body in which the material is imbedded or transplanted. But the tissues of identical twins are exactly the same, and there is no allergic reaction when their skin or other organs are exchanged. Knowledge of this tissue relationship has permitted the transplanting of kidneys between identical twins without the ill effects suffered by ordinary humans when an organ transplant is attempted.

Although most twins are born at the same time, Mrs. Doreen Atwell, wife of a schoolteacher at Port of Spain, Trinidad, gave birth to a son prematurely on December 3, 1963. His twin sister did not arrive until January 4, 1964, more than a month later.

There are more than two million twins in the United States alone. And the mothers have formed an exclusive club called the National Organization of Mothers of Twins. The club publishes a monthly newsletter which permits members to exchange information on the subject of twins.

Twins usually start life with one strike against them in that their arrival generally is two to four weeks premature. And 15 years ago, the mortality of twins during the first month of life was three times that of single birth children. How-

ever, better care is available today for premature children, and after the babies have overcome the hazards of early delivery they develop at the same rate as other infants. If the delivery of twins can be delayed until after the seventh month of pregnancy, the chances of survival are improved.

And mothers expecting twins should follow the doctor's instructions carefully. Doctors frequently can diagnose the presence of twins by the 24th week of the pregnancy. Obstetrical problems sometimes occur if the umbilical cords become twisted together. A further complication may be the size of the twins. Although large twins are rare—the record for combined weight is about 18 and a half pounds—they can be delivered more skillfully today than in past years. The usual combined weight of twins is around 10 pounds. If the twins are born prematurely, the mother may have to leave them at the hospital for a while. The advice of women who are the mothers of twins is: take advantage of the time you have before the twins come home; it may be the last opportunity for rest and relaxation that you will have for quite a while.

Additional advice from mothers of twins is to take advantage of visits from friends, neighbors and relatives. Let them help take care of the youngsters, particularly at feeding and diaper changing time.

Body heat to warm the house

STUDENTS sitting in air-conditioned classrooms at the new Johnstown campus of the *University of Pittsburgh* will be doing more than learning. They'll be heating their own dormitory in absentia.

Among the first unique climate control systems of its kind, excess heat from lights and students will be collected at a central plant in winter and redistributed through underground pipes to heat six buildings of the new campus.

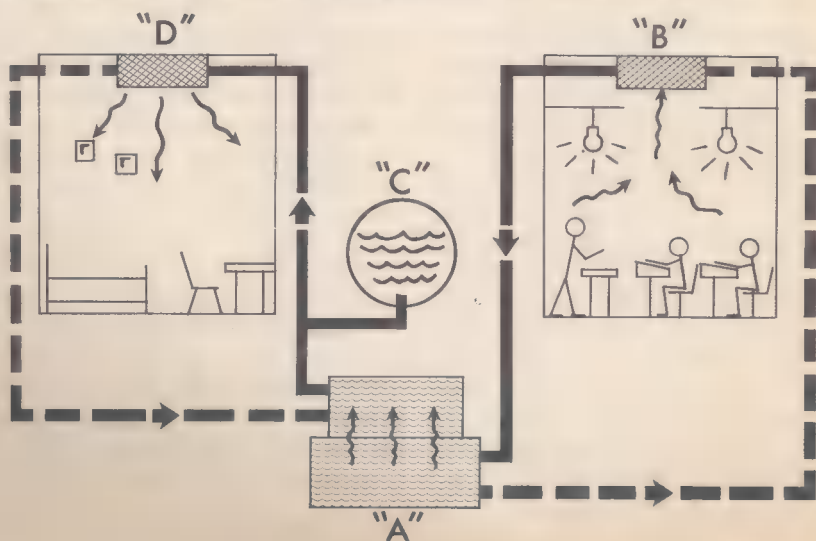
Despite winters as cold as 10 below zero, the campus has no chim-

neys, no boilers, no conventional heating equipment. Instead, a single Carrier centrifugal refrigerating machine provides both heating and cooling through what is known as a heat reclaim, interior air-source heat pump or "bootstrap" system.

The all-electric climate control system automatically removes heat from where it is not wanted, such as classrooms and kitchen, and transfers it to where it is needed in winter, such as dormitories. In summer the heat is thrown away.

The system operates as a conven-

Sketch shows heat reclaim system. Refrigeration machine (A) chills water which goes (dotted line) to air conditioning unit (B) in classroom. Water cools room by extracting heat from lights, students in the room. This warmed water then returns (solid line) to refrigeration machine (A). Heat transfers to condenser water circuit atop machine and machine compressor increases temperature. This warmed water is either stored in water tank (C) for future use or piped underground to heating units (D) in various buildings.





Two storage tanks, each holding 10,000 gallons of water, store excess heat from the heat reclaim system at the University of Pittsburgh for use on nights and weekends when classrooms and other areas alone do not produce enough heat for the system.

tional air conditioning system in summer, rejecting its heat to the atmosphere through a cooling tower. The heat reclaim cycle takes over as soon as heat is required.

Heart of the heat reclaim cycle is the centrifugal water chilling machine installed in the central plant room. The 200-ton machine supplies 42°F chilled water to air conditioning units for three of the buildings.

Heat given off by lights, students, machines and the cafeteria kitchen is absorbed by this chilled water and is transferred through the refrigera-

tion machine to the heating water circuit. This 130°F water is then distributed through underground pipes to all six campus buildings and is also used to heat domestic hot water. The three dormitories, housing a total of 361 students, are supplied with hot water only and are not cooled.

In addition, electric converters built into the piping system for each building can be used to bring water up to 130°F. These converters are designed to operate during prolonged cold spells and vacation periods.

When to stop

Ohio State University engineers are studying ways to improve rear-end lighting systems on automobiles. They are specifically looking for alternatives to the usual, but much-

criticized, red taillight-red stoplight systems.

Common complaint against the red-red system is that drivers many times are unable to distinguish differences in the lights and fail to recognize when an automobile is brak-



Rack of 32 experimental taillights and stoplights being used in on-the-road studies of rear-end lighting systems is examined by an engineer at Ohio State.

ing. Earlier tests have shown that a different colored taillight in combination with a red stoplight reduces confusion on the part of the car-following driver.

Engineers pointed out that any alternative system must display at least as much information as the current system. That is, it must show braking action, a running light, turn signals, back up lights and location of the vehicle.

Pesticides for dinner

Certain kinds of soil-dwelling microorganisms love to chew up pesticides. Some don't, but they learn to live on the chemicals.

With the help of such bacteria, *Cornell University* scientists are learning in greater detail what happens to pesticides after application.

The microorganism called *Arthrobacter*, for example, attacks the widely used weed killer 2,4-D and converts it into entirely new prod-

ucts. These and other kinds of bacteria are found to be capable of digesting the weed killer MCPA.

The findings are significant in that scientists are able to trace, step by step, the little known sequence of chemical changes in pesticides as they break down in soils and plants.

Friction and the weather

Friction between winds and the surface of the sea has a profound effect on both the oceans and the atmosphere, and in fact governs the climate of the world as a whole, according to a *University of Miami* atmospheric scientist.

"Friction between the westerlies and the surface below tends to increase the rotation of the earth and slow down the motion of the air as seen from the outside (space)," says Dr. Erik B. Kraus, director of the University of Miami's Institute of Atmospheric Science. "At the lower boundary of the easterlies, the effect is opposite. If one of these two effects were greater than the other, it would cause a change in the earth's rotation, and that would make our day longer or shorter.

"In reality," he added, "the atmosphere adjusts itself in such a way as to make the friction torque of the westerlies and easterlies approximately equal.

"Balance is maintained by the cyclones (low pressure areas) and anticyclones (high pressure areas) that one sees on the weather map."

Poisons in the home

Each year thousands of children are poisoned accidentally—but often due to someone's carelessness. The problem is on the increase, yet it needn't be if proper precautions are taken.

by Thomas Haley, M.D.,
University of Hawaii,
and Andrew Hamilton

THE time was 9:30 a.m., the place Kansas City, Mo. Mrs. Jones was enjoying a second cup of coffee while chatting by telephone with a friend. When she put down the receiver, the house seemed deathly quiet. Where was her 4-year-old Jimmy?

She rushed through the house and found him on the bathroom floor, choking, with an empty bottle of rubbing alcohol at his side.

Every year some 600,000 home poisonings take place in the United States. The majority of victims are children between ages two and five; 53 percent are boys; most accidents occur between 9 and 10 a.m.; late summer or early fall is the most frequent time of the year; and an overdose of medicine or drugs is often the cause.

In spite of efforts by doctors, druggists, pharmaceutical firms and the press to alert parents to the dangers of toxic and poisonous substances in the home, accidental poisoning is on the increase.

When the Thomas J. Fleming

Memorial Poison Center was opened in the Children's Hospital of Los Angeles in 1957, there were 1,700 calls from physicians who needed special information to treat a grim variety of poison cases. Last year there were 18,647 cases—an 11-fold increase in less than a decade.

One-third of all home poisonings are caused by drugs and medication. Until recently, sweetened medication such as orange and raspberry-flavored aspirin was especially dangerous to small children because they gulped it down like candy. This kind of aspirin has now been banned by the U.S. Food and Drug Administration. Another improvement is the requirement that bottles containing children's aspirin be limited to 36 tablets—less than a lethal dose for young people.

The average home medicine cabinet also contains many other pitfalls for the curious child—as well as the sleepy, intoxicated or disturbed adult. Sleeping pills, tranquilizers, reducing pills and iron tablets are all potential killers.

Ferrous sulfate or iron tablets are especially dangerous to children.

Four years ago there was no antidote for iron poisoning, and victims were usually dead within three days. But medical science has now discovered that desferrioxamine will draw iron particles from the intestinal tract and blood stream and render them inert. The patient can resume normal activities in three days.

One suggestion: get rid of prescriptions and special medications after the patient has recovered by flushing them down the toilet. *Don't* throw them into waste baskets where they can be removed by children. In Philadelphia, three youngsters recently died after eating rat poison resembling cereal that had been thrown into a trash can.

Some families still use chemicals that have been found to possess little or no medical value. One such is boric acid. This unpredictable chemical was once thought to have antiseptic properties, but no longer. Dusting powders, eye washes and solutions containing boric acid should be banned from the medicine chest. Infants are particularly sensitive to it, and there is no specific antidote.

Next to drugs and medications, household cleaning preparations such as soaps, bleaches and caustics result in the largest number of poisonings in the home. Parents who exercise every caution in keeping the medicine cabinet locked often may ignore the possibility that the cleaning cupboard is left unguarded.

Mothers working in the kitchen

or laundry are apt to become so preoccupied with their tasks that junior explorers have ample time and opportunity to get into disinfectants, oven cleaners, furniture polishes, spot removers or strong acids and alkalis left within reach.

In Atlanta not long ago, a frantic mother rushed her poisoned child to the emergency entrance of a nearby hospital. He had sampled a mixture of detergent and chlorine bleach while crawling on the kitchen floor. After his stomach was pumped out the baby made a quick recovery and was taken home.

In less than an hour, however, mother and son were back for a second stomach pumping.

"The little rascal went right back to the same bucket of cleaning fluid and took another drink," said the mother, as if it were his fault.

Harmful sprays

Aerosols and other spray cleaners often possess ingredients that are caustic to the skin or internal membranes of the nose, throat and lungs. For example: spray-on oven cleaners contain potassium hydroxide, which can burn as severely as lye. Furniture polish frequently includes butter of antimony, a chemical that can seriously depress respiration and heart beat. Drain cleaners combine alkalis with oxalic acid, a potent chemical that can plug up the kidneys.

Fumes and gases released by certain cleaning agents can also do irreparable damage to internal mem-

*Many of the average woman's beauty aids
are potential threats to an inquisitive child.*

branes and organs. If exposure is long and close enough, the effects can be fatal. Only recently, health authorities have become aware of the hazards created by mixing household bleach with ammonia—thus liberating deadly quantities of chlorine gas. Carbon tetrachloride is a common ingredient of cleaning fluids and can damage the liver and kidneys if its fumes are inhaled over a prolonged period.

The typical American home garden harbors from one to 10 plants which, if handled improperly, can cause illness or death. And in nearby swamps, fields and woodlands, another 10 to 20 flowers, grasses and shrubs can poison the unwary sampler. For example, a 5-year-old girl in Phoenix, Ariz., was hospitalized after chewing and swallowing castor beans; an 18-month-old baby in Columbus, Ohio, died from backyard toadstools; a small boy in Fort Lauderdale, Fla., became seriously ill after drinking water in which oleander blossoms had been placed.

Products calculated to improve personal grooming can also be a source of trouble if left where small hands can get at them. Spray deodorants contain aluminum chloride, which can cause serious irritation when sprayed in the face or when ingested. Many preparations to beautify the hair—cold wave products, lacquers and hair coloring

—can cause a predisposition to pneumonia if too much is inhaled.

Nail polish and polish remover may attract children because of their exotic colors, but the ingredients are as harmful as kitchen cleansers. Another beauty aid that frequently tempts toddlers is perfume. Youngsters apparently assume that it will taste as good as it smells. The high alcoholic content of perfume is a partial threat, but the fixatives it contains are a major danger since they may damage the kidneys.

Mothballs, moth cake or moth crystals contain paradichlorobenzene to kill insect larvae. But it can be just as deadly to small human beings who mistake it for candy. Many of the cake deodorizers used in the bathroom contain the same toxic chemical. One of the cruelest hoaxes is to distribute moth balls or ant poison as Halloween "trick-or-treat" favors. Yet this is sometimes done, as recent news stories from Portland, Ore., Greenlawn, N.Y., and Alhambra, Calif., indicate.

As pest killers have become more selective, they have become more potent. Doctors are gratified by the decreasing use of lead and arsenicals in pesticides, but hope that parents won't misinterpret information on some labels.

For example, it might be assumed that a product is relatively harmless

when the label reads, "Two per cent active ingredients, 98 per cent inactive ingredients." One should realize, however, that the carrier of these ingredients is a petroleum distillate. It will not kill insects, but is lethal to children if they drink it.

Liquid insecticides are a danger both to children and adults. Youngsters sometimes swallow such poisons if the solution is stored carelessly in a soft drink bottle or an old food container. A mother in Fort Thomas, Ky., picked up the wrong bottle from a windowsill and poured her daughter a deadly teaspoon of insecticide instead of medicine. Toxic quantities of insecticide sprays can be absorbed through unbroken skin as well as through the lungs. In Winter Haven, Fla., an 8-year-old girl died when her father used a poisonous citrus tree spray inside the house to kill ants.

Inquisitiveness deadly

Increased use of weed killers is another reason for padlocking the garage or garden shed. Manufacturers of such herbicides are quite explicit in their warnings to keep children and pets away from garden areas that have been treated. Snail bait, slug killers and ant poisons must be placed so as to be accessible to these pests. Parents should keep in mind that, unfortunately, children are apt to investigate these same areas.

Antifreeze is also a deadly poison. In Yakima, Wash., two boys died

and three were made seriously ill when they drank pinkish-colored antifreeze, thinking it was wine. A motorist whose car stalled in the desert near Death Valley, Calif., died from drinking radiator water that contained anti-freeze.

The first Poison Information Center was established in Chicago in 1953. Today there are approximately 500 in all parts of the United States. These centers provide 24-hour service to doctors who need quick, authoritative information about the 75,000 toxic products used in industry, on the farm and at home. Each of these deadly products is catalogued as to its toxic properties, symptoms and recommended treatment.

At present there are six specific antidotes for this deadly array of poisons: (1) BAL or British antilewisite, specific against mercury, gold, arsenic and certain other heavy materials; (2) methylene blue for methemoglobinemia, a blood disorder caused by coal tar dyes; (3) calcium versenate for lead and iron poisoning; (4) nalline for overdoses of morphine and morphine derivatives; (5) atrophine sulfate and PAM for organic phosphates used in certain insecticides; and (6) amyl nitride for cyanide.

Here are the *preventive* measures you can take to safeguard your family against poisoning:

- Read carefully the labels on all bottles and packages of drugs, medicines and household supplies—especially new products that may be stronger or different from those

that have been used previously.

- Store them in a safe place—under lock and key, if necessary.
- Keep the telephone number of your physician *and* the nearest emergency hospital handy.

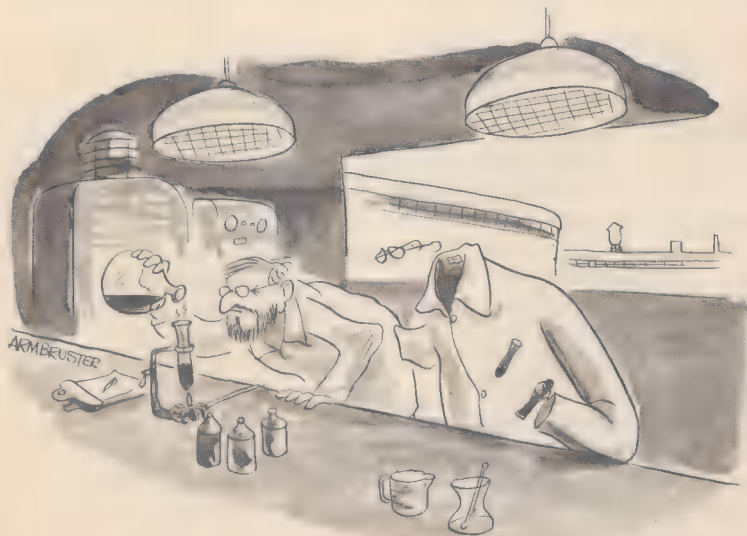
If some member of your family becomes poisoned, here is what you should do:

- Don't panic; a cool head is needed in such an emergency.
- Try to determine the kind of poison and how much has been ingested.
- Call your physician or an emergency hospital immediately.
- Save a sample of the poison to show the doctor.
- Don't try to administer first aid.

This is probably a waste of time when you are trying to get the victim to a doctor.

Some poisonings are fatal—especially if the victim reaches treatment after too long a wait, or the chemical is one for which there is no specific antidote.

But the good news is this: even though the *total* number of poisonings is on the rise, modern medical research and treatment is bringing the *percentage* of fatalities down. Today less than one percent of all poison cases are fatal. The public—especially parents with small children in the home—can cut the death toll even more sharply if they take proper precautions.



"Holmgren, I think I'm on to something."



How kids see their doctors

"I thought supplying crayons and colored pencils and art paper would give young patients something to do while waiting for their doctor's appointments," says Milton Gold, director of subscriber relations for the Health Insurance Plan of Greater New York. "Then I came up with the idea of having the art paper edged with scrollwork to make it appear like a framed picture and having 'MY DOCTOR' imprinted at the bottom."

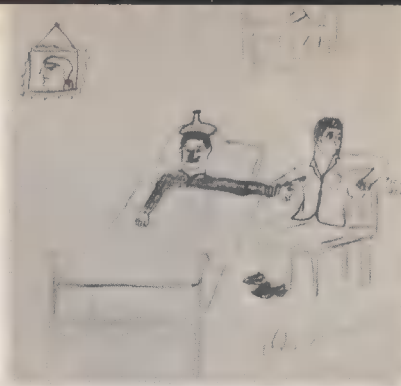
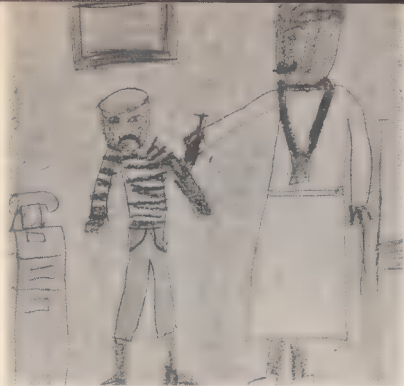
The results, some of which are shown on these pages, are now touring 31 H.I.P. medical centers. The crayon and colored-pencil drawings on art paper are youngsters' impressions of their doctors. The idea has snowballed far beyond Gold's

most optimistic expectations.

The children were told prizes would be awarded those drawing the best impressions of their doctors. Then the deluge began. More than a thousand children in the 20 centers participating entered their youthful impressions of their doctors. For the most part the doctors fared very well, emerging as smiling, kindly souls. But there were exceptions.

"The six- and seven-year-olds drew everything imaginatively and way out of proportion with reality," explained Gold. "But the 10-year-olds were more self-conscious, with the result that their drawings were somewhat stilted."

Some children drew themselves



very tall in relation to the doctors, while others pictured themselves as extremely small. One child's drawing had the doctor standing on the examining table because the youngster didn't know how to draw the physician standing beside the table. The most prevalent characteristic of the drawings, besides the needle, was the doctor depicted as an attractive blonde woman. Some children sketched a female representative of the profession even though their pediatricians were males.

The drawings often showed a fear of the doctor's needle. Several young artists pictured themselves wincing or crying at the sight of the hypodermic while the doctors looked on smilingly. One young

boy had armed himself with a needle.

A quick-thinking seven-year-old included the unusual in his picture. He sketched on his doctor's office wall a sign which read: "You don't have to be crazy to take this job, but it helps."

The pictures were so good that the judges of the contest decided there should be no losers. Those who were not awarded first or second prize won honorable mention. All contestants received a letter from the president of H.I.P. and an oil crayon set. Gold, for fostering the contest, is being deluged with letters from various medical societies and centers seeking information on starting similar projects.



Different types of cloud formations, such as these shown here, are only part of a whole day's weather picture that can be viewed in less than half an hour in a unique building in Reno known as Atmospherium. This 35-mm frame of clouds was enlarged 640,000 times.

WHAT'S THE WEATHER LIKE INSIDE?

by James G. Busse

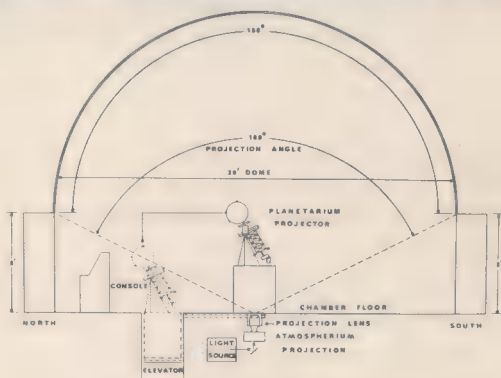
THUNDER booms; lightning flashes; a storm swirls across the sky. You hear the sound of falling rain all around you and suddenly get the urge to reach for an umbrella. But not a single drop of rain falls and, after a few minutes, the storm clouds begin to scatter.

The sun quickly reappears in a magnificent burst of color. The sky is clear again.

Unusual weather? Not at all. It occurs every day *inside* the 30-foot dome of a remarkable building on the campus of the University of Nevada in Reno. The futuristic structure is known as an "atmospherium." There, up to 100 visi-



A rear view of the University of Nevada's Atmospherium in Reno (above) shows the building's unusual one-piece hyperbolic-paraboloid roof. Diagram (at right) shows the positioning of Atmospherium and Planetary projectors. When Planetary is in use, it occupies the center of chamber. When presentations are given in the Atmospherium, the star projector slides to one side and is lowered into floor, exposing Atmospherium projection.



tors at a time can witness a whole day's weather—from sunrise to sunset—in less than half an hour, and without even getting damp.

The secret of the impressive performances at the Atmospherium is a unique optical projection system. It was developed and assembled under the guidance of Prof. Wendell A. Mordy, director of the university's Desert Research Institute, in close cooperation with engineers at Spitz Laboratories, Inc., Wilming-

ton, Del., planetarium builders.

The Atmospherium's projector is the only one of its kind in the world. Although it resembles the standard wide-angle motion picture projectors used in theaters, the resemblance ends with the addition of a special optical system and a revolutionary 180-degree lens valued at \$8,000. The instrument is capable of projecting undistorted, full-color views of the entire sky upon the inner surface of the At-

mospherium's dome. As a result, a seemingly endless sky surrounds the viewer with startling realism.

The sound of weather accompanies the dramatic visual effects inside the Atmospherium. A powerful stereo-high-fidelity sound system, complete with four-track tape recorder, is connected to large speakers concealed in the dome.

With the flick of a switch, the engineer at the Atmospherium's master control console can obtain the realistic sound of wind, thunder, falling rain or other weather noises. The illusion is complete: you actually feel you're outside, witnessing the changing moods of nature.

To provide films for the Atmospherium programs, a special 35-mm motion picture camera with a matching 180-degree lens was developed by engineers at Meteorology Research, Inc., of Altadena, Calif. The camera makes a continuous, full-color photographic record of events taking place in the sky, from horizon to horizon.

Through the use of time-lapse photography, scientists at the Atmospherium are able to "speed up" the normal cycle of weather. In effect, hours of weather can be condensed into minutes; years into days. Atmospherium scientists have already learned much about meteorological phenomena.

The University of Nevada is also using the Atmospherium as a laboratory-classroom for teaching the atmospheric sciences. The Atmospherium can provide students with graphic answers to such questions

as: Why are sunsets red? How do thunderstorms develop? Why is the air clear one day and smoggy the next? The types of clouds and cloud movements generally associated with various kinds of weather also can be illustrated.

The Atmospherium building itself is as unique as the equipment it houses. Its hyperbolic-paraboloid roof rests on only two supports, although it covers an area of 11,000 square feet. Giant louvers shield the huge windows on the south side of the building from direct sunlight. Vertically mounted, they are turned by electric motors controlled by a precision clock mechanism to follow the sun's movement.

Entirely aluminum, the hollow metal louvers are painted black on one side and white on the other. In winter, the black side is turned outward and readily absorbs solar heat. Air passing through the louvers is warmed and forced through the coils of a heat exchanger, where the heat is transferred to water. The water is then stored in a large, insulated tank and used to warm the building. In summer, the white side of each louver reflects solar heat away from the building. At the same time, cold water pumped from a deep well is used to cool the Atmospherium.

Built at a cost of approximately half a million dollars, the world's first Atmospherium is now in full operation. In addition to its use in education and university supported research, the Atmospherium is open to the public.

Idea of the Month

"Undersea auto"

THE research physicist who developed the Navy's Sidewinder air-to-air missile has invented what has been called the first undersea automobile.

The craft is a glass bathysphere mounted on a pair of fiberglass catamaran hulls. The pilot can transmit control signals through the transparent wall of the bubble in which he sits.

Dr. William B. McLean, technical director of the Naval Ordnance Test Station at China Lake, Calif., who recently received Patent 3,351,035, is building a two-passenger model with a capsule 56 inches in diameter.

The inventor, an avid skin diver, set out to provide some means of descent better than "putting on rubber suits, wearing tanks and then being limited to depths of 150 or 200 feet." He wanted divers to be able to see clearly, breathe at atmospheric pressure, go as deep as they liked and come up quickly.

The bathysphere opens like a clam shell to admit the crew and the hemispheres are sealed with a rubber ring.

To operate the motor and other equipment, the pilot turns knobs



First undersea auto is glass bathysphere, which opens like a clam shell, mounted on a pair of fiberglass catamaran hulls.

and switches on an inside panel. Through the glass, an optical image of the board is transmitted to photo receptors that trigger the controls.

For descent, the catamarans can be flooded, and for return to the surface they can be emptied by the release of compressed gas. At neutral buoyancy, movable elevator vanes permit driving up and down, and objects can be picked up from the ocean floor with a scoop.

Dr. McLean hopes to keep costs within the budget of a university or private enthusiast. Walter G. Finch of Baltimore, his attorney and half owner of the invention, has filed patent applications in many foreign countries, including the U.S.S.R.

The U.S. government gave Dr. McLean a \$25,000 award in 1956 for conceiving the Sidewinder. In 1965 he received the \$10,000 Rockefeller Public Service Award for Science, Technology and Engineering.—*Stacy V. Jones*



Fred Coston

Gerbils, popular as household pets today, have an unusual adaptability for arid climates which comes from centuries of dwelling in the desert.

How desert animals beat the heat

by John and Molly Daugherty

GERBILS are not welcome in California—except as laboratory animals. Arizona may also pass a law banning gerbils as pets. They multiply too fast and can destroy millions of grazing acres in the Southwest.

Because gerbils have lived in the desert for centuries, they have unusual adaptation to arid climate.

What do you know about the way desert animals beat the heat?

1. The desert gerbils of the rodent family were imported to the U. S. about 1954. Now they are becoming popular family pets. The gerbils
 - a. Need lots of water to drink
 - b. Can regulate body temperature to withstand intense heat
 - c. Must seek shelter from the hot sun
2. The pocket gopher tolerates heat by
 - a. Going underground
 - b. Perspiring freely
 - c. Carrying water in his cheek pouches
3. The donkey tolerates body dehydration remarkably well. In summer, when water is used for body heat regulation, his water loss, compared to the camel, is

- a. Three to four times greater
 - b. Ten times less
 - c. About the same
4. Mammals lose water in ridding the body of waste products. The kangaroo rat differs from larger mammals in that
- a. Concentration of salt in his urine is low
 - b. No urine is formed
 - c. The urine is highly concentrated
5. The camel's huge well-insulated body and slow rate of evaporation of water helps him survive desert heat for long periods, but his body temperature
- a. Remains constant
 - b. Fluctuates
 - c. Stays below normal until dehydration is severe
6. Compared with white rats in a lab, desert pack rats tolerate water deprivation
- a. Better than
 - b. The same as
 - c. Less well than
7. Desert regions are known for great temperature variations, especially from day to night. On the Arizona desert the annual variation in temperature is greatest for the
- a. Air over the desert
 - b. Soil surfaces
 - c. Underground burrows used by animals
8. Desert birds' tolerance to temperature compared with that of non-desert relatives is
- a. Greater than
 - b. Less than
 - c. Similar to
9. The kangaroo rat maintains its water balance from
- a. Moisture in the burrows he digs
 - b. Metabolic processes in oxidation of food
 - c. Cactus plants which store water
10. The gila monster found in the Southwest responds to the hottest days by going into a state of
- a. Hypnosis
 - b. Hibernation
 - c. Estivation

Answers:

1—b Can regulate body temperature to withstand intense heat. They can go a long time without water because the food gerbils eat supplies water in the oxidation process in its body.

2—a Going underground. During the long arid summer, the pocket gopher spends his time with little activity in tunnels which admit little heat and light. He uses his cheek pouches to carry and store food temporarily.

3—a Three to four times greater. His evaporation rate is much greater than the camel's because of the donkey's smaller body size and lack of much insulation. A donkey can withstand a water loss of 30 percent of his body weight. At water holes he can drink to full capacity—one-fourth of his body weight and get away in a few minutes.

4—c The urine is highly concentrated. It is so concentrated that 24 percent of the urine is urea, and little water is used. The salt content is twice as great as that of sea water.

5—b Fluctuates. The huge size of the camel coupled with a fluctuating body temperature allows him to absorb vast amounts of heat slowly. It takes him a long time to heat up.

The camel sweats on the skin surface but not on the thick fur covering which slows the evaporation rate. He can drink about 30 percent of his body weight in water in a single drinking session. The hump, of course, is fat, and not water-storage.

6—c Less well than. The desert pack rat needs much water, but he gets a good water supply from the cactus.

Why Can't You Remember?

A noted publisher in Chicago reports there is a simple technique for acquiring a powerful memory which can pay you real dividends in both business and social advancement and works like magic to give you added poise, necessary self-confidence and greater popularity.

According to this publisher, many people do not realize how much they could influence others simply by remembering accurately everything they see, hear, or read. Whether in business, at social functions or even in casual conversations with new acquaintances, there are ways in which you can dominate each situation by your ability to remember.

To acquaint the readers of this publication with the easy-to-follow rules for developing skill in remembering anything you choose to remember, the publishers have printed full details of their self-training method in a new booklet, "Adventures in Memory," which will be mailed free to anyone who requests it. No obligation. Send your name, address, and zip code to: Memory Studies, 835 Diversey Parkway, Dept. 690-012, Chicago, Ill. 60614. A postcard will do.

The white domesticated rat can't stand the cactus spines, which pack rats can handle without trouble. Pack rats fed in captivity on dry grain but no water died in four to nine days. White rats lived 15 to 21 days under the same conditions.

7—b Soil surfaces. Variations in temperature may be as great as 144° F. Variations in the air above the soil surfaces is much less—about one-third to one-half as great. Most of the heating of the air comes from re-radiation of energy received by the earth. Temperature variation in the burrows is small—usually only a few degrees and not more than 20° F.

8—c Similar to. In extreme heat, desert birds are more active in early morning and late afternoon. When they reproduce, they shield their eggs and nestlings from overheating.

Lethal body temperature is 45°—47° C. Their usual body temperature is 40°—42° C.

9—b Metabolic processes in oxidation of food. Laboratory experiments on the kangaroo rat show that for every 100 grams of food eaten (air-dried barley), 54 grams of water was produced by oxidation in the body of the rat. The only other water sources (in small amounts) came from absorbed water on the food and pre-formed water in the food compounds.

10—c Estivation. Estivation is passing the summer in a torpid condition.

Score yourself:

9—10 right—You covered a large area well

4—8 right—You didn't sweat it!

0—3 right—Burrow in the library

Each month Dr. Isaac Asimov chooses one of the questions you send in to answer. He does not make the job easy on himself, for in past months he has written about such things as relativity, parity and the basic nature of light. Following Dr. Asimov's answer are the answers to some of your other questions written by regular members of the Science Digest staff.



Death of the Sun

How long will the sun be able to sustain life on earth?

The sun will be able to sustain life (as we know it) on earth as long as it radiates energy in its present manner. We can set certain limits as to how long this might be.

The radiation of the sun is produced by the fusion of hydrogen to helium. To produce all the radiation poured out by the sun, a vast amount of fusion must take place. Indeed, 630 million tons of hydrogen must be fused to 625,400,000 tons of helium each second. (The 4,600,000 tons left over is converted into radiant energy and is lost to the sun forever. The tiny quantity of this energy that happens to hit the earth is sufficient to support all the life on our planet.)

It may seem that with this quantity of hydrogen being consumed

each second, the sun cannot last long—but that does not take into account the vast size of the sun. It has a mass of 2,200,000,000,000,000,000,000,000 (over two billion billion billion) tons altogether. About 53 percent of this mass is hydrogen, which means that the sun now contains about 1,160,000,000,000,000,000,000,000 tons of hydrogen.

(If you are curious, the rest of the sun's mass is almost all helium. Less than 0.1 percent of its mass is made up of atoms more complicated than helium. Helium is more compact than hydrogen. Under identical conditions, a quantity of helium atoms would have four times as much mass as the same quantity of hydrogen atoms. A particular mass of helium, in other words, takes up less room than the same mass of hydrogen. In terms of volume—the room taken up—the sun

is about 80 percent hydrogen.)

If we suppose that the sun was originally all hydrogen and that it has always been turning hydrogen into helium at the rate of 630 million tons per second and will always continue doing so, then we can calculate that the sun has been radiating for roughly 40 billion years and will continue to radiate for another 60 billion.

Actually, things are not quite so simple. The sun is a "second-generation star," built up out of cosmic gas and dust left over by stars that had burnt and exploded billions of years before. The sun's raw material therefore contained much helium to begin with; almost as much as it now has. This means that the sun has only been radiating a short while, astronomically speaking, for its original hydrogen supply has declined only moderately. The sun may be no more than six billion years old.

Nor will the sun continue to radiate at exactly its present rate.

The hydrogen and helium in the sun do not mix thoroughly. The helium is concentrated in the central core of the sun, and the fusion reaction takes place at the surface of this core.

As the sun continues radiating, the helium core gets more massive and the temperature at its center grows higher. Eventually, the temperature grows high enough there to force helium atoms into more complicated atoms. Till that point, the sun will radiate much as it does now, but after helium-fusion begins it will begin to expand and gradually become a red giant. The heat on earth will become unbearable; the oceans will boil away; and the planet will no longer be an abode for life as we know it.

Astronomers estimate that the sun will enter this new phase about eight billion years from now.

Eight billion years is still a pretty long time, however, so there is no immediate cause for alarm.

—Isaac Asimov

I know that there are a few wild horses left in America today, but that they are descendants of horses brought over by the Spanish. In much earlier times America had its own native horses. What happened to them?

At the end of the last ice age some ten thousand years ago, the horse, along with most other large native North American mammals, sudden-

ly and quite mysteriously died out. Writing in *Natural History Magazine*, Paul S. Martin, professor of geochronology at the University of Arizona, says, "Native North American mammals exceeding 100 pounds in adult body weight were reduced by roughly 70 percent. The casualty list includes mammoths, mastodon, many species of horses and camels, four genera of ground sloths, two of peccary, shrub oxen, antelope, two genera of saber-toothed cats,

the dire wolf, the giant beaver, tapirs and others totaling over 100 species. Despite this fantastic loss of large animals during the Pleistocene, the most recent geologic epoch, the fossil record shows no loss of small vertebrates, plants, aquatic organisms or marine life."

The conventional explanation for this "abrupt and almost simultaneous extinction of large mammals," according to Martin, is that the climate underwent a drastic change during the three-million-year Pleistocene period, and that many of the large mammals were unable to adjust to the change and so died out. But Martin does not believe this explanation solves all the problems.

In the first place, large mammals of today are remarkably tolerant of different types of environments.

In the second place the extinctions occurred when the climactic conditions were actually improving.

Martin notes, however, that the wave of extinctions seems to follow the arrival of man on the scene. "My own hypothesis is that man and man alone was responsible for the unique wave of Late Pleistocene extinction—a case of overkill rather than 'overchill' as implied by the climactic change theory."

The key to this overkill was fire. With it the hunters could drive entire herds to their deaths over a cliff. "Early man may not have been able to avoid killing the herd animals in excess. To capture any members of a bison or elephant herd, it was necessary to kill them all . . ." says Martin.

Why Are You Ignored When You Talk?

A noted publisher in Chicago reports a simple technique of everyday conversation which can pay you real dividends in social and business advancement and works like magic to give you poise, self-confidence and greater popularity.

According to this publisher, many people do not realize how much they could influence others simply by what they say and how they say it. Whether in business, at social functions, or even in casual conversations with new acquaintances there are ways to make a good impression every time you talk.

To acquaint the readers of this publication with the easy-to-follow rules for developing skill in everyday conversation, the publishers have printed full details of their interesting self-training method in a new booklet, "Adventures in Conversation," which will be mailed free to anyone who requests it. No obligation. Send your name, address, and zip code to: Conversation, 835 Diversey Parkway, Dept. 690-012, Chicago, Ill. 60614. A postcard will do.

Don't throw it to the dog—

It may be from the Trichecodon huxley.

Hunting For Fossils. Marian Murray, Macmillan. (\$7.95)

One of the most pernicious hobby diseases for anyone exposed to the "virus" even briefly, is fossil hunting, according to this dedicated fossil hunter. Judging from her enthusiastic and highly informative "do-it-yourself" instructions, she has an incurable attack of the "disease." What's more, her enthusiasm comes through in such large doses that there's little doubt her book will spread the "disease" far and wide. By the time this reviewer was half way through the fascinating volume, he could hardly wait to arm himself with pick and soft brush in order to tackle a certain likely sedimentary deposit in a certain deep stream gorge in Eastern Pennsylvania.

Marian Murray caught the "bug" when she found—in her own front yard—an ancient walrus tusk (*Trichecodon*), which turned out to be the second one known to man. Harvard's Museum of Comparative Zoology put out a special bulletin on it!

Since then she has been picking at, and dusting, rocks and fossil bones all over the map. As a professional-type amateur, she has decided to convey her excitement and pleasure in fossil hunting to other

potential amateurs—briefing them, first, in the basic facts of paleontology, geology, fossil formation and the like. Geologic periods, and what lived during each Era, Period and Epoch, are neatly laid out in handy charts. The reader moves through the formation of the simplest sea fossils on up the scale through the trilobites, the vegetation, the giant reptiles of *Triassic* times, to mammals.

Not only does she tell you *how* to find them, but *where*. Likely sites in all the fossil-laden states are listed in detail. Example: "Teeth, bony armor plates, vertebrae and a few skulls of the carnivorous crocodile-like phytosaurs have been found at several localities in the Chama and Santa Rosa-Tucumcari (N.M.) areas."

And the book is full of fascinating anecdotes and tidbits of curious information. Connecticut, you learn, will have a dinosaur park—all because a bulldozer driver turned up a batch of big bones and, instead of pushing them over the embankment along with the fill, reported the event to the proper authorities.

Anyone who doesn't get fossil-happy after reading this volume should properly be worried about him- (or her-) self.—*R.F.D.*

Other new books of interest

The Ever-Changing Sea. David B. Ericson and Goesta Wollin. Alfred A. Knopf. (\$7.95). These two noted oceanographers tell the fascinating real story of what is going on now, and what has gone on in the past, far below the surfaces of the world's oceans. Until very recently, man merely thought of these depths as dark, silent, unchanging abysses.

You Are Extraordinary. Roger J. Williams. Random House. (\$5.95). Every person is a highly distinctive individual, from his central nervous system to his outward appearance. The author, a professor of biochemistry, tells about these individual biochemical differences in layman's language, and he emphasizes the

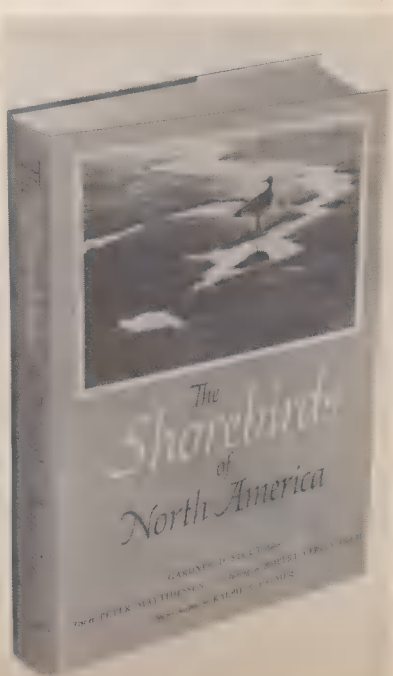
need for evaluating one another with this in mind—not basing everything on the “average man.”

Guide to Modern Medical Care. S. D. Klotz. Charles Scribner's Sons. (\$7.95). From a physician with over 30 years of clinical experience comes this book dealing with the ABCs of medicine. He tells everything from how to choose a doctor, dentist, etc., to what fees to expect to pay for various medical tests and services.

The Search for the Robots. Alfred J. Cote Jr. Basic Books, Inc. (\$5.95). What kind of strategy does a computer use to beat a checkers champion at his own game? This is one of the fascinating questions discussed in this look at the “intelligent machines” of today—and the

The Shorebirds of North America. Edited by Gardner D. Stout. Viking Press. (\$22.50)

This huge and expensive book is what is known in the trade as a coffee table item. But don't sneer—it is a great deal more. The paintings by Robert Verity Clem are magnificent and the text by Peter Matthiessen is written with great clarity and understanding. In addition to being a beautiful and readable book, *The Shorebirds of North America* is also a definitive reference work on the subject. The printing, binding and production are all excellent. For the bird lover, this book is worth the price, and considering the price, that's saying a lot.



Why Do You Read So Slowly?

A noted publisher in Chicago reports there is a simple technique of rapid reading which should enable you to double your reading speed and yet retain much more. Most people do not realize how much they could increase their pleasure, success and income by reading faster and more accurately.

According to this publisher, anyone, regardless of his present reading skill, can use this simple technique to improve his reading ability to a remarkable degree. Whether reading stories, books, technical matter, it becomes possible to read sentences at a glance and entire pages in seconds with this method.

To acquaint the readers of this publication with the easy-to-follow rules for developing rapid reading skill, the company has printed full details of its interesting self-training method in a new booklet, "How to Read Faster and Retain More" mailed free to anyone who requests it. No obligation. Send your name, address, and zip code to: Reading, 835 Diversey Parkway, Dept. 690-012, Chicago, Ill. 60614. A postcard will do.

engineers and scientists who are creating them.

Of Predation and Life. Paul L. Errington. Iowa State University Press. "Predation belongs in the equation of Life," writes the author, and this book emphasizes the role animals' eating one another plays in biological systems and the balance of nature.

DNA: At the Core of Life Itself. Lawrence Lessing and the Editors of Fortune. The Macmillan Co. (\$3.95). The genetic key to life is a double strand of chemical molecules called DNA that make up the 46 chromosomes in every man. This short (80 pages) book tells the profound importance of this molecule which was discovered not too many years ago, and how the knowledge of it holds the door open for man to control his own heredity.

Science and Imagination. Warren Weaver. Basic Books, Inc. (\$5.95). This collection of papers by an award-winning scientist-statesman and former director of the Rockefeller Foundation covers a diversity of topics including the theory of relativity and science and religion.

Mathematics for the Modern Mind. Walter R. Fuchs. The Macmillan Co. (\$6.95). That mathematics can be fascinating and fun for anyone who enjoys thinking is the prime theorem involved here. Numerous colorful drawings and diagrams help prove that theorem.

CLASSIFIED ADVERTISEMENTS

Rate: \$5.00 for first 2 lines each insertion. \$3.00 each additional line. Minimum space accepted is 2 lines, payable in advance. Count 45 characters and/or spaces per line. To be inserted under the proper classification, copy must be in our office by the 1st of the second month preceding date of issue. The next available issue to place an advertisement in Science Digest is May. The closing date is March 1st. Send remittance and order to: Rex Coston, Classified Advertising Manager, Science Digest, 575 Lexington Avenue, New York, New York 10022. Please make remittance payable to Science Digest.

SCIENCE & CHEMISTRY

VORTEX Atom booklet with 1967 supplement on "The Duality of Particle and Wave". A centralized but non-nuclear system of atomic structure applicable to many of the unsolved problems of physics and chemistry, such as the unified field problem and the benzene ring problem. 36 pages with three-dimensional diagrams. 25 cents. C. F. Krafft, 4809 Columbia Rd., Annandale, Va. 22005.

300 Page Chemical & Apparatus Catalog \$3.00. Laboratory Materials, 1330A Hyde Park, Chicago 15.

MODEL Cannon ignition fuse 3/32" diameter, water proof, 25 feet \$1.00-125 feet \$4.00 postpaid. Free catalog. Zeller, Box 642, Hudson, Mich. 49247

FREE Periodic Classification of Elements and Conversion Tables With Catalog 354. Chemicals, Apparatus, Biology. Mid-States Scientific, 7053 N. Clark, Chicago, Ill.

ESP Kit Scientifically, mathematically test for all types ESP. Contains Rhine Cards, mood pictures, much more. Instructions. Great science project, party entertainment. \$5.00 Guar. Becken Co. CE 11-SD, Tijeras, New Mexico 87059.

ISOTOPE Index. Tells where to buy 2000 compounds tagged with more than 450 radioactive or stable isotopes. A must if you use or buy isotopes. \$10/copy P. P. Also: Atomic bomb effects computer with instructions book \$5 P. P. Figures blast and heat effect for any bomb size, height, or distance. A must for CD units. S. E. C., Box 19086 SD, Indianapolis, Indiana 46219.

UFO's - How they fly. Prof. pilot reveals new aviation concept. Logical development leads to flying saucer. Explains glow, mag. field, performance, thrust. VTO. Send \$1.00. R. E. Field, P.O. Box 58036, Houston, Texas 77058.

MACH-X Rocket shoots 600 ft. up, descends in free fall, then ejects parachutes, 11 time delays. Only \$4.98 ppd. Swedenberg, Box 180, Indianhead, Maryland 20640.

BOOKLET On new atomic core model restates isotopic number and chemical nobility, explains Rydberg's squares and Bohr's hydrogen, and derives alpha-eta configuration. 25 cents. Y. M. Waage, 30 East 2nd Street, Apt. 22, Duluth, Minnesota 55802.

PROFESSIONAL Model rocket fuse, burns underwater, 75 feet, \$1.00. Pyrochemsd, Box 169, Berlin, New Jersey 08009.

VAST Converging stellar energies hit atoms, push-them-out, and cause gravity. Summary 10¢. Carnahan, 2007 Eaton Lane, Austin, Texas 78723.

LASER Pistol—\$1.00. How to build Laser Rifle, Electronic Laser, Helium-Neon Laser—\$4.95 each. New project on Flying Saucers—\$1.95. Complete Project Catalogue—25¢. Roy Davis Lab., Dept. SD, Drawer 17067, Jacksonville, Florida 32216.

FOR INVENTORS

INVENTIONS. Ideas—Searched—Developed—Marketed, formerly: United States Government Patent Examiner, Advisor, Raymond Lee, 75-N East 45 St., N.Y.C. 10017.

PATENT Searches complete and thorough. Related copies Air Mailed with maximum speed \$6.00. Free "Protection Forms" and "Patent Information". Write American Patent Search Company, Dept. 29, 711 14th St., N.W., Washington, D. C. 20005.

INVENTIONS WANTED

TECHNOLOGY Marketing Service. Inventions for industry. 2255 Rand Tower, Mpls., Minn. 55402.

INVENTIONS Wanted. Patented, unpatented. Global Marketing, 2420-AC 77th, Oakland 5, Calif.

INVENTORS! Don't sell your invention, patented or unpatented, until you receive our offer. Eagle Development Company, Dept. J, 79 Wall Street, New York 5, N. Y.

FORMULAS, PLANS, ETC.

YOUR Classified ad in this space will be seen by more than 146,000 active mailorder buyers. For rates and information write: Classified Ad Dept. 96, Science Digest, 575 Lexington Ave., New York, New York 10022.

ENGINES, MOTORS, DYNAMOS

STEAM AUTO & Steamboat brochure. Send only two dollars. Shaw Co., Box 21204, Concord, Calif. 94521.

MACHINERY, TOOLS & SUPPLIES

PLEASE Be sure to include your zip code when ordering merchandise from classified advertisements. You'll receive faster delivery.

AVIATION

BUILD Rocket engines! Send for illustrated book "How to Design, Build, and Test Small Liquid-Fuel Rocket Engines" \$3.50 no COD. Rocketlab, Dept. SD-2, P.O. Box 5636, China Lake, Calif. 93555.

BOATS

FREE Catalogue - plans for canoes, kayaks, accessories. Clark, SD 115 McGavock Pike, Nashville, Tennessee 37214.

TREASURE FINDERS

FIND Buried treasure with new revolutionary analytical metal detector. Features push button tuning, automatic tuning, loudspeaker, negligible ground pickup, greatest range. Free catalog. Gardiner Electronics, Dept. 59, 4729 N. 7th Ave., Phoenix, Arizona 85013.

TREASURE Hunters! Prospectors! Relco's new instruments detect buried gold, silver, coins. Kits, assembled models. Transistorized. Weighs 3 pounds, \$19.95 up. Free catalog. Relco-A88, Box 10839, Houston, Texas 77018.

EDUCATION & INSTRUCTION

FINISH High school in 10 weeks, low cost. Send name, age, highest grade completed. E.P.I., P.O. Box 3146, Mesa, Arizona 85201.

EARN College or High School diploma at home. All subjects. Free brochure. Ohio Christian College. 1156 Striebel Road, Columbus 13, Ohio 43227.

PREDICTIONS Of things to come! ESP, cat-
alysms, etc., plus 80 other astonishing subjects. Free booklet, "Cosmic Awareness Speaks". Servants of Awareness, Box 115-SD, Olympia, Washington.

BE A Real Estate Broker. Big earnings. Free catalog. Write - Weaver School of Real Estate, 3519-A3 Broadway, Kansas City, Mo. 64111.

TOP Paving Jobs—Guidance Manual \$1. Canadian Institute of Science & Technology, 263K Adelaide St. W., Toronto.

LEMURIAN Viewpoint—Meaningful discussions of Cosmic Truth: the purpose of human life, reincarnation, man's place in a Higher Plan, and subjects from the Lemurian Philosophy. Send for Free copy. Lemurian Fellowship, Dept. 759, Box 397, Ramona, Calif. 92063.

EARN A British diploma in Radionics, Botanic medicine, Homeopathy, Super-Science, Divinity, Philosophy. 35 courses, prospectus free. Brantridge Forest School "Lodge", Brantridge Forest, Balcombe, Sussex, England.

EXPERIMENT With sleep-learning! Fascinating, educational. Use your recorder, phonograph or amazing new Electronic Educator endless tape-recorder. Astonishing details, huge catalog of tapes, records, equipment free! Sleep-Learning Association. Box 24-SD, Olympia, Washington 98501.

CHRISTIAN Tracts, free. Christian Tract Center, 3905 Victoria, Hampton, Virginia USA 23669

FREE! Self-hypnosis, sleep learning, mind power record/book catalog. Azedian, 57 Elm, Fresno, Calif. 93706 (Include zip code)

COMPUTER Logic. Design new "electronic brains"! Rewarding careers! Homestudy certificate program. Write for free brochure: Computer Sciences Institute, 11727-C, Mayfield, L. A., Calif. 90049.

CUT Note taking, writing time in half. Simple course learned in two hours. A child can do. Only \$1.95. H. Frank, 5117 Penway, Phila., Pa. 24

BOOKPLATES

FREE Catalog—Many beautiful designs. Address Antioch Bookplate Co., Yellow Springs 13, Ohio.

BOOKS, PERIODICALS

KNOW More about the earth you live on. Earth Science, bimonthly Magazine, Box 550S, Downers Grove, Ill. 60615 Subscription \$2.50. Sample 35¢.

PERPETUAL Motion Journal. Amazing developments. Info. free. 1616G Compton, St. Louis, Mo. 63104

EVOLUTION A Religious Dogma, 50¢: Evolution and Modern Christian, \$1.00; Christian Evidence League, Malverne, N.Y. 11565

PUBLISH Your book! Join our successful authors: publicity advertising promotion, beautiful books. All subjects invited. Send for free manuscript report and detailed booklet. Carlton Press, Dept. XSS, 84 Fifth Avenue, New York 10011.

PLAYS, STORIES, MANUSCRIPTS

Your Classified ad in this space will be seen by more than 146,000 active mailorder buyers. For rates and information write: Classified Ad Dept. 96, Science Digest, 575 Lexington Ave., New York, New York 10022.

ATHLETIC & BODYBUILDING COURSES

"GIANT ARMS." Dr. Young's D.C. Revolutionary Discovery, \$2. Satisfaction or refund. Gauch, Box 9309-S, Chicago, Ill. 60690.

PETS—BIRDS, CATS, HAMSTERS, ETC.

LIVE Seahorses, marine specimens, aquarium supplies. Illustrated catalog 15¢. Marine, Box 248-104, Dania, Florida.

WILDLIFE Pets-Mammals, birds, reptiles. Catalog 10¢ Ray Singleton, Interbay Station, Tampa, Florida 33611.

GERBILS - New pet 32-page book \$1. Also 6 young Gerbils \$25 Air Express prepaid. You'll like them. Write to Gerbils, Box 633, Springfield, Virginia.

RABBITS-FUR BEARING ANIMALS

EARN \$10,000 Yearly raising Angora Rabbit wool and breeding stock for us. Information 25¢ coin. American Angora Company, Malta 39, Montana 59538.

MAKE Big money raising chinchillas, guinea pigs, rabbits, mink or pigeons for us. Free information. Keeney Brothers Farms, New Freedom, Pa. 17349.

RAISE Rabbits for us on \$500 month plan. Free details. White's Rabbitry, Mt. Vernon, Ohio 43050.

HOBBIES & COLLECTIONS

THE Magno-Lite illuminates and enlarges maps, coins, etc. 3 1/4" long. \$1.50. The Four Forty Co., B-1, 440 Bruner St., Akron, Ohio 44306.

COINS, TOKENS, CURRENCY

■ HARD To find ■ mint Lincoln cents \$1.70. B. Wallace, 196 Holstein Rd., Gulph Mills, Pa.

WE'LL Pay you to join our National Coin Club. Serious collectors send 10¢ for exciting details: Coins, Dept. SD, 543 Madison, N. Y. 10022.

STAMP COLLECTING

100 DIFFERENT World wide 10¢. Approvals. Main Lee Co., P. O. Box 424, Ft. Lee 4, N. J. 07024.

AFGHANISTAN! 50 Colorful mint pictorials \$1.00. Approvals. Shamrock, Box 453, Kenmore, Wn. 98028.

FREE Stamps with all approvals. Townsend, P.O. Box 74, Tyrone, Pennsylvania 16886.

MODELS—SHIPS, TRAINS, PLANES, ETC.

IMPORTED Miniature wild animals for collectors, hobbyists. Lifelike scale models. Illustrated catalog 50¢. Walters, 207 French, Utica, N. Y. 13502

ANTIQUES, RELICS, INDIAN GOODS AND CURIOS

Your Classified ad in this space will be seen by more than 140,000 active mailorder buyers. For rates and information write: Classified Ad Dept. 96, Science Digest, 575 Lexington Ave., New York, New York 10022.

MAGIC TRICKS, PUZZLES, JOKER NOVELTIES

COMPLETELY Illustrated magic catalog; 84 pages, 25¢. Manhattan Magic, Box 334D, N.Y.C. 10011.

1000 AMAZING Tricks, stunts, illusions, magic! Giant 164 page catalog! Illustrated! Exciting! Only 25¢. House of 1000 Mysteries, Dept. SD68, Ft. Lauderdale, Florida 33308

MUSIC AND MUSICAL INSTRUMENTS

POEMS. Songs wanted for new hit songs and recordings by America's most popular studio. Tin Pan Alley, 1650-SD Broadway, New York 10019.

WHEN Answering classified advertisements, don't forget to say you saw it in Science Digest.

Science Digest—February, 1968

COLOR SLIDES

MISS America slides: 20 color slides of Pageant \$5.00. Free brochure. Box 433, Atlantic City, N. J.

BUSINESS OPPORTUNITIES

HOW To obtain capital, details \$1.00. Double money back guarantee. Rodgers, Box 5653, Pgh., Pa. 15207.

OPERATE Restaurant or diner. Free booklet reveals profitable plan. Write Restaurant Business School, Dept. JC-28, 1920 Sunnyside, Chicago, Illinois 60640.

IMPORT Export opportunity, profitable worldwide, mail-order business from home, without capital, or travel abroad. We ship proven plan, for no risk examination. Experience unnecessary. Free details. Mellinger, Dept. B1872, Los Angeles 90025.

PROFITABLE OCCUPATIONS

START A magazine subscription business. Earn generous commissions on Popular Mechanics. Good Housekeeping and all others. Best commissions, bonus, all material sent free. No experience needed. Write: Popular Mechanics, Room 9-P, 250 West 55th Street, New York City 10019.

MONEYMAKING OPPORTUNITIES

START Your own business! Free booklet shows you how! Send 10¢ for postage and handling to Popular Mechanics Classified, Dept. SD, 575 Lexington Avenue, New York City 10022.

HELP WANTED

AUSTRALIA Wants you! Government assisted passage. Unlimited opportunities. Latest government information and forms \$1.00. Austco, Box 3623-P, Long Beach, California 90803.

EMPLOYMENT INFORMATION

FOREIGN Employment. Construction, other work projects. Good paying overseas jobs with extras, travel expenses. Write only: Foreign Service Bureau, Dept. SD, Bradenton Beach, Florida 33510

BUY IT WHOLESALE

WORLDS Largest wholesale supply. Buy from 7852 American, European, Japanese wholesalers. Hong-Kong tailor-made suits, 123 dropship catalogs. Rock-bottom prices. Free details. International Buyers, P.O. Box 4633, Colorado Springs, Colo. 80909.

EXPORT-IMPORT

MAILORDER Imports. Report reveals foreign dropship sources. World Trader's Digest. Ideal mailorder items. \$1.00 Adco's Bargain House, Rt. 3, Box 379-F, Dept. SDA, Longview, Texas 75601

DO-IT-YOURSELF

EXERCISE At home on build-it-yourself physical fitness equipment, including bicycle exerciser, rowing machine, belt massager, and abdominal board. Send \$2.50 for blueprints B1208 and instructions. Popular Mechanics Service Bureau, 575-SD Lexington Ave., New York, N.Y. 10022.

PROTECT Our waters! Beautiful pens. \$1.00. Informative slogans mark our time! Undersigned by Medusa Press, Inc., 4960 Sprague Road, Cleveland, Ohio 44141.

FOR THE HOME

Your Classified ad in this space will be seen by more than 146,000 active mailorder buyers. For rates and information write: Classified Ad Dept. 96, Science Digest, 575 Lexington Ave., New York, New York 10022.

HOME CRAFTSMEN

FREE Check-list covering more than 300 classifications of projects, plans, instructions, service and repair information detailed in Popular Mechanics famous series of instructional booklets, books, patterns, and blueprints. List covers an extremely wide variety of do-it-yourself data on home remodeling, repair and improvement, hobbies, crafts, boating, games, lawn and garden, and hundreds of others. For your free copy of this helpful list, write to: Service Bureau, Popular Mechanics, Dept. SD, 575 Lexington Avenue, New York City 10022.

PRINTING, MULTIGRAPHING MIMEOGRAPHING, GUMMED LABELS

EMBOSS Business cards \$3.99/1,000. Wagner Co., Dept. SD2, 6200 Whitewood, Library, Pa. 15129.

LOW Cost offset printing, mimeographing, bus. cards, envelopes. Free brochures, introductory offer. Seaview, 8115-X Ave. L, Brooklyn, N.Y. 11236.

ADVERTISING AGENCIES, ADV. SERVICE, MAILING LISTS

MAILORDER Record book, 30 pages. Records inquiries, orders, advertising expense, etc. Most complete. Just send dime for postage and handling to C. A. Martin, Popular Mechanics, Dept. SD, 575 Lexington Avenue, New York, New York 10022.

SPECIAL SERVICES

AUSTRALIA: Remailing, souvenirs, coins, special assignments, business rep. professional services. Box 38, Northbridge, NSW 2068, Australia.

PERSONAL

INVESTIGATORS, Free brochure, latest subminiature electronic surveillance equipment. Ace Electronics, 11500-D NW 7th Ave., Miami, Fla. 33168.

WHEN Answering classified advertisements, don't forget to say you saw it in Science Digest.

MUSIC Lovers, continuous, uninterrupted background music from your FM radio, using new inexpensive adapter. Free literature. R. Clifton, 11500-A NW 7th Ave., Miami, Fla. 33168.

BILLS Paid Without Borrowing—Nobody Refused up to \$18,000.00. Bad Credit No Problem—Not a Loan Co. Write for Free Application—International Acceptance, Dept. SDC, 5133 N. Central Ave., Phoenix, Arizona 85012—119 Ann St., Hartford, Conn. 06103—507 Carondelet St., New Orleans, La. 70130—or 504 Victoria Ave., Windsor, Ontario, Canada.

"PSYCHIC Dominance—How to rule others with your thoughts." Full Course—with stirring Exercises. \$3. Illustrated. Satisfaction or refund.—Clarion, Box 9309-S, Chicago, Ill. 60690.

STAMMER—Stutter—no more. (Dr. Young) Write: Gaucho, Box 9309-S, Chicago 60690.

RESURRECTED Billions will farm ocean bottoms when seas removed by coming whirlwind! Free. Write: Harvest-SD, Jefferson City, Mo. 65101.

GRAPHOLOGY! Have your personality thoroughly studied by a professional. Handwrite, air-mail your letter including \$20.00 note to Roy L. Hudson, Casilla 933, Viña del Mar, Chile

JOIN Us in telepathic efforts. Pleasure and new friends assured. Inquire Scientific Research Association, 2439 Belknap Blvd., Keokuk, Iowa 52632.

WANTED—MISCELLANEOUS

MERCURY—Gold—silver—platinum for cash. Circular. Ore assays. W-Terminal, Norwood, Mass.

MISCELLANEOUS

MIRACLE Basket made of plastic covered wire; in white, trimmed in your choice of blue, red, green, pink, or gold. Large \$1.79, smaller \$1.25 ppd. Lewis Sales, Box 123, Clarendon Hills, Ill. 60514

FREE Popular Mechanics 16 page illustrated catalog of publications, plans and projects. Booklet covers an extremely wide variety of do-it-yourself data on home remodeling, shop tools and machines, car repair, hobbies, crafts, boating, games, lawn and garden and hundreds of others. For your free copy write to: Service Bureau, Dept. SD, Popular Mechanics, 575 Lexington Avenue, New York, New York 10022.

ZIP Code directory list every P. O. in the U.S. and possessions—35,000 listed P.P. \$1. Lewis Sales, Box 1235, Clarendon Hills, Ill. 60514.

GUIDED Missile bank. All metal, plated silver color. 13" high. \$4.95. The Four Forty Co., B-2, 440 Bruner St., Akron, Ohio 44305.

WINEMAKERS—Free catalog and recipes. Kraus, Box 451-R, Nevada, Missouri 64772.

"AS A Man Thinketh." 56 Pages Philosophical reading. Truly a Masterpiece. \$1 to Standard Specialties, Box 4382, San Francisco, Calif. 94101.

PLEASE Be sure to include your zip code when ordering merchandise from classified advertisements. You'll receive faster delivery.

TO LETTERS

SCIENCE DIGEST

Index cheered

I was happy to see you publish again your half year index to *Science Digest* (December '67). The index permits easy reference to back copies which I keep filed on a bookshelf.

BARRY KRAUSE
Joliet, Ill.

Infrared confusion

This will be just one of many fingers pointing at what seems to be a glaring error in the article, *Infrared: Lighting up the Invisible*, (November '67) by James R. Berry, or a misinterpretation on my part.

On page 45 it says, "... oceanographers studying some infrared portraits of the Atlantic Ocean identified a dark streak meandering down the water's eastern end as the Gulf Stream, an important current about 10 degrees warmer than surrounding water."

I interpret this to read that the Gulf Stream, though 10 degrees warmer, appears as a dark streak. Elsewhere in the article, and in other articles I have read on thermographs, it states that warmer areas appear lighter.

If it happens that this was an error, I feel a twinge of conscience

Changing Your Address?

If you're planning to move, please let us know six weeks before changing your address. Attach address label and fill in your name and new address. This will insure fast service on your subscription.

ATTACH LABEL HERE

(Address label found on wrapper of Science Digest.)

(If not available, be sure to include your old address including Zip Code Number.)

Be sure to send back your old and new address to: Science Digest, Box # 654, New York, N.Y. 10019

Name _____
(please print)

NEW
Address _____

City _____

State _____

ZIP CODE _____

Space age minded ?

Look ahead to an
exciting career in
engineering.
Start now. At

MSOE

Residence study at MSOE leads
to B.S. degrees in Electrical and
Mechanical Engineering and
Engineering Technologies.

Other courses lead to Associate
in Applied Science degrees in
these engineering technologies:

computer . . . electrical power
. . . electronic communications

. . . air conditioning . . . fluid
power . . . internal combustion

engines . . . metallurgy . . .
welding . . . chemical . . .

architectural and building
construction. Find out about

financial aids, and job

placements. Ap-

proved for G.I. Bill.

Send for details.



MS 302A

MILWAUKEE SCHOOL OF ENGINEERING
Dept. SD-268, 1025 North Milwaukee Street
Milwaukee, Wisconsin 53201

Please send the "Your Career" booklet.

I'm interested in

☐ Electrical fields ☐ Mechanical fields

NAME _____ AGE _____

ADDRESS _____

CITY _____ STATE _____ ZIP _____

in even pointing it out to a magazine
that makes relatively few of them.

D. G. JULSON
Fallon, Nev.

AUTHOR'S REPLY:

Like X-ray pictures, infrared photo-
graphs are usually studied right after
development. This film is then equiv-
alent to the negative, and heat does
show up as lighter areas.

But sometimes researchers prefer
to make a print or enlargement of
the negative. In *this* case, black areas
indicate heat; the lighter areas, cold.
In the case of the Gulf Stream photos,
oceanographers were working from
enlargements and the dark line in-
dicated a warm current.

Sorry for the confusion. I should
have mentioned that both negatives
and enlargements are used to analyze
infrared photographs.

JAMES R. BERRY
Brooklyn, N.Y.

Why a white gorilla?

In your July '67 issue, a picture of
a snow white gorilla attracted every-
body's attention. We are wondering
what caused its bright white color?
The color of gorillas is normally
black or brown varied more or less
with gray, which increases in amount
with age. The Little Snowflake is
only two years old.

MICHEL TAKLA
Cairo, U.A.R.

*Little Snowflake is most assuredly
an unusual gorilla because of his
white coloring. He is the first albino
gorilla known to man. Albinos, hu-
man or lower animal, are lacking
pigment in the skin, hair and eyes to
give color.—Ed.*



The new guillotine?

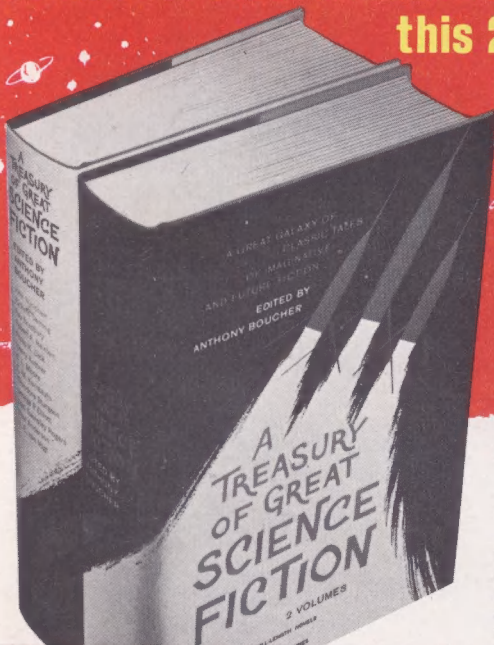
THE notorious guillotine about to behead a victim? No, it's actually a testing device being used at General Motors Proving Ground near Milford, Mich., to help determine motor safety standards. The machine, which closely resembles the treacherous chopper so popular during the French Revolution, drops an instrumented load cell onto the chests of test dummies to standardize their spring rate. These dummies are then slammed against steering

wheels as part of a performance test for production and experimental steering assembly design. This particular impact tool has been used by engineers to calibrate chest spring rates on all dummies used in the entire automotive industry for compliance with Federal Motor Vehicle Safety Standards. By using only one testing device, engineers insure that wherever dummies are used, test results can be compared accurately to one set of standards.

The Science Fiction Book Club invites you to take this 2-volume Treasury of Great Science Fiction for only

10¢

when you join the Science Fiction
Book Club and agree to accept only
4 books during the coming year.



A TREASURY OF GREAT SCIENCE FICTION

Edited by Anthony Boucher

Two giant volumes. Over 1000 pages of exciting fiction. A handsome addition to your library. Includes John Wyndham's classic *Re-Birth* . . . Heinlein's *Waldo* . . . Anderson's *Brain Wave* . . . a total of 4 full-length novels, 12 novelets, 3 short stories by such masters as Bradbury, Arthur Clarke, Judith Merril, Alfred Bester, A. E. Van Vogt, C. M. Kornbluth, Theodore Sturgeon — and more.

SCIENCE FICTION BOOK CLUB

Dept. 82-SDX, Garden City, N.Y. 11530

Please accept my application for membership in the Science Fiction Book Club and rush me *The Treasury of Great Science Fiction*. I enclose 10¢ to help cover shipping. Then, every month, send me the Club's free bulletin, "Things to Come," which describes coming selections. For each book I accept, I will pay \$1.49, plus shipping and handling, unless I take an extra-value selection at a higher price. I need take only four books within a year and may resign any time thereafter.

NO-RISK GUARANTEE: If not delighted with my introductory package, I may return it in 10 days, pay nothing, owe nothing, and my membership will be canceled.

Name _____ (PLEASE PRINT)

Address _____

City _____ State _____ Zip _____

If under 18, parent must sign here (Offer good in U.S.A. only.) 23-S73B

TAKE this 2-volume Treasury of Great Science Fiction — a "must" for any S-F fan — for only 10¢ . . . with a short trial membership in the Science Fiction Book Club.

How to Get This Unusual Value

Because you enjoy Science thrillers, the Science Fiction Book Club would like to acquaint you with the most imaginative, informative, entertaining new science fiction books as they are written. That is why we have arranged to send you this 1000-page Treasury of Great Science Fiction for only 10¢, to help cover shipping and with a Trial Membership in the Club.

Here's how the Club works: each month it offers a really superb new science fact or fiction book at a fraction of its regular price. Even though these books sell for \$4.95, \$5.95 and more in their original editions, Club members get them **FOR ONLY \$1.49 EACH** — in special full-length, hard-cover editions. Extra-value books cost more. And the Club tells you in advance what each monthly selection will be. During your Trial Subscription you agree to take as few as four books in the next twelve months. After that you may take as few or as many books as you want, and you may cancel at any time.

No Risk Guarantee

Send for your big introductory package today. After ten days, if you are **NOT** delighted, return the books and your membership will be canceled. Otherwise you will be enrolled in the Club as a Trial Member, and you need take only four books in the next twelve months. Mail the coupon today to: Science Fiction Book Club, Garden City, New York 11530.